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Eight Scientists Protest Thomas Committee's Methods

We print below the full text of a telegram wired to President Truman on September 6 by eight distinguished scientists. The President's comments on this wire appear on page 292. The authors of the wire are: HARRISON BROWN, Associate Professor, Institute for Nuclear Studies, University of Chicago; KARL TAYLOR COMPTON, President, Massachusetts Institute of Technology; THORFIN R. HOGNESS, Director, Institute of Radiobiology and Biophysics, University of Chicago; CHARLES C. LAURITSEN, Professor of Physics, California Institute of Technology; PHILIP M. MORSE, Professor of Physics, Massachusetts Intitute of Technology; GEORGE B. PEGRAM, Profesor of Physics and Dean of the Graduate Faculties, Columbia University; HAROLD C. UREY, Professor, Institute for Nuclear Studies, University of Chicago, Nobel Prize winner; JOHN C. WARNER, Dean of the Graduate School and Chairman of the Department of Chemistry, Carnegie Institute of Technology.

Dear Mr. President:

As a group of Americans who during and since the war have had some part in the development of atomic energy, we feel impelled to call your attention, and that of the country, to a dangerous situation in this field that has been developing for some time. We believe that it is a situation which, if it continues, may seriously jeopardize research in atomic energy, and consequently our national security.

It is our sincere hope that the situation can be remedied before irreparable harm is done.

The problem we are concerned about has to do with the adequate staffing of the national atomic energy laboratories with scientists and engineers of the caliber required to carry out a necessary vigorous research program. With the greatest respect to those relatively few excellent men who are now attempting to carry out adequate programs at Brookhaven, Berkeley, Argonne, Los Alamos, Hanford and Oak Ridge, we are forced to the conclusion that the combined full-time personnel of highly capable scientists and engineers in the various laboratories is on the verge of reaching a dangerously low level.

The factors which are creating such an undesirable situation are many and varied. But, in our opinion, a substantial portion of the blame can be placed upon the atmosphere which is being created by the actions and smearing methods of the House Committee on Un-American Activities. We do not deny the possible need for investigations such as are being carried out by the Committee, but the fact remains that, in spite of its best intentions, the Committee is creating an atmosphere that makes men shun government work, thereby threatening us all.

Of the more than 150 senior American scientists mentioned in the Smyth Report who were actively engaged in the war-time projects, fewer than 10 per cent are now devoting their full energies to the various government atomic energy programs. An equally small percentage is devoting even part time to the endeavors. This might have been expected for most of them were older men who, during the period of the war, temporarily stepped out of permanent positions to assume wartime responsibilities. We can expect that the tactics of the Un-American Activities Committee, if they continue as in the past, will make the situation even more acute.

During the war atomic energy was a young man's business. On the Plutonium Project, for example, a count taken in 1944 during the height of the research activities showed that 60% of the scientists were under 30 years of age, 80% were under 35, and 90% were under 40. It is among these younger men that our nation must expect to find its leadership in atomic energy research during the coming years.

But few of these men remain in government service to assume leadership. Many have not remained because they have found it increasingly difficult to reconcile themselves to government employment on secret projects where they are looked upon by groups such as the Un-American Activities Committee as men not to be trusted, where they must subject themselves to the possibility of irresponsible smears that may ruin them professionally for life. In many cases the men prefer to work elsewhere for considerably lower salaries on research programs completely unconnected with our atomic endeavors.

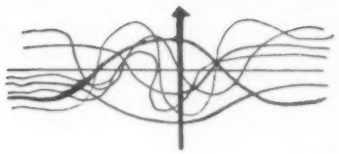
It is not our desire to underestimate the possible damage that could be done to the United States by espionage agents of potential enemy nations. We recognize the likelihood that such agents may be operating in this country. We further believe that proper steps should be taken through responsible agencies of our government in order to minimize the effectiveness of espionage activities.

Even the necessary amount of security precautions presents obstacles to the progress of technological development. Any action that purports to be in the interests of security must be taken with great care. Every effort must be made to avoid creating any greater obstacles to research than are absolutely necessary. Should information ever be uncovered by well-trained potential enemy agents, it could scarcely jeopardize our security more effectively than the atmosphere which exists today.

Since the end of the war the Un-American Activities Committee has created a situation within which it is becoming increasingly difficult for scientists and engineers to function. The start was made in 1946 when a Committee delegation quizzed scientists in Oak Ridge. Following this, Mr. J. Parnell Thomas wrote an article for *Liberty* magazine, which was a masterpiece of insinuation, entitled "Reds in our Atomic Bomb Plants". This was followed by a similar article in the June 1947 issue of *American Magazine*. The climax was reached this Spring, however, when the Committee issued its attack against Dr. Edward U. Condon. That attack was so repugnant to scientists that it will be years before the damage can be undone. And in the face of rumors of attacks yet to come, it will become increasingly difficult to retain top scientists in government service.

(Continued on page 320.)

PRESIDENT TRUMAN SPEAKS TO THE SCIENTISTS



President Truman presents here his views on the relation between government and scientific research. He also comments on the telegram he received from eight scientists concerning the effect on scientists of current security investigation procedures (see page 290). The full text of the address given by President Truman before the American Association for the Advancement of Science in Washington on September 13 is given below.

Mr. President, members of the American Association for the Advancement of Science, ladies and gentlemen:

I certainly call it a privilege and an honor to be able to appear here tonight to welcome you to this Washington centennial celebration. I want to say to you that as soon as I have made my welcoming speech, it will be necessary for me to go over to the White House and prepare a half-dozen political speeches, more or less, for future use. I can assure you that this is one of those non-political appearances of the President of the United States.

I am deeply honored in being with you tonight on the one hundredth anniversary of the founding of the American Association for the Advancement of Science. As President of the United States, I welcome you to Washington.

In the one hundred years since this association was organized, science has helped transform the United States into the most productive nation in the world. I know that in your meetings this week you will be looking back over the progress of American science in the past century. I also know that you are much more interested in looking into the future.

You are looking forward, I know, because we stand at this moment at the threshold of revolutionary developments. In fact I think we are facing the greatest age in history. Scientific research daily becomes more important to our agriculture, our industry, and our health.

The members of this association know better than I what developments to expect in the years ahead in physics, in chemistry, in biology and the other sciences, but I am certain of this—that science will change our lives in the century ahead even more than it has changed them in the hundred years just past.

I am making that as a prophecy. I am [not] in the same class with the Commissioner of Patents who appeared before the Appropriations Committee of the Senate about 1844 or 1845. I discovered this when Dr. Condon's predecessor was down before the Appropriations Committee of the Senate and tried to get an appropriation for the Bureau of Standards, and he was having a lot of trouble getting it.

This patent commissioner came up with a recommendation to the Senate in 1844 or 1845 that the patent office should be abolished simply because everything that could be invented and patented had been invented and patented, and there wasn't any use continuing a patent office in existence.

We have a lot of people like that even today. I don't think you belong in that class.

National Policy and Scientific Research

I hope you will also be thinking about the relationship between science and our national policy.

Two years ago I appointed a scientific research board. Its report, entitled Science and Public Policy, was submitted last fall to the Eightieth Congress. That report stressed the importance of science to our national welfare, and it contained a number of important recommendations.

The most important were these:

First, we should double our total public and private allocations of funds to the sciences. We are now devoting, through Federal and private expenditure, little more than one billion dollars a year for research and development. That sounds like an immense sum. With a national income of more than $200,000,000,000 annually, the board felt that we should devote at least $2,000,000,000, to scientific research and development each year. And when you consider that is a very, very small amount when compared to that $200,000,000,000, I think it ought to be done.

Second, greater emphasis should be placed on basic research and on medical research.

Third, a national science foundation should be established. I pleaded with that Congress to give me a national science foundation. They offered a national science bill which eliminated the President from the Government of the United States, and I wouldn't sign it.

Fourth, more aid should be granted to the universities, both for student scholarships and for research facilities.

Fifth, the work of the research agencies of the Federal Government should be better financed and coordinated.

I hope that you have been weighing these recommendations carefully, and that if you agree with me that they are sound, you will consider how they can be made effective national policies. [I] think it is vitally important.

I know that you are also deeply concerned with the relationship of science to our national defense and security. Three years ago, when the fighting stopped, all of us were eager to return to our peacetime pursuits. The first thought of a great many of us was how to translate our wartime advances in scientific knowledge into better standards of living.

It is an unfortunate fact, however, that the peace we hoped for has not come quickly. We are still living in hazardous times. We are required to give unremitting thought to the defense of the United States at a period when defense has become incredibly more difficult and more expensive. American scientists must, like all the rest of our citizens, devote a part of their strength and skill to keeping the nation strong.

At a time when we hoped our scientific efforts could be directed almost exclusively to improving the well-being of our people, we must, instead, make unprecedented peacetime efforts to maintain our military strength. For we have learned—we have learned the hard and bitter way—that we cannot hope for lasting peace with justice if we do not remain strong in the cause of peace.

I remember at Potsdam, we got to discussing a matter in eastern Poland, and it was remarked by the Prime Minister of Great Britain that the Pope would not be happy over that arrangement of that Catholic end of Poland. And the Generalissimo, the Prime Minister of Russia leaned on the table, and he pulled his mustache like that, and looked over at Mr. Churchill and said: "Mr. Churchill, Mr. Prime Minister, how many divisions did you say the Pope had?"

If we are to maintain the leadership in science that is essential to national strength, we must vigorously press ahead in research. There is one simple axiom on which this thought is based. The secrets of nature are not our monopoly. Any nation that is willing and able to make the effort can learn the secrets that we have learned. Such a nation may, indeed, discover new facts of nature we have not yet discovered.

Our problem, therefore, is not a static one of preserving what we have. Our problem is to continue to engage in pure—or fundamental—research in all scientific fields. Such research alone leads to striking developments that mean leadership. Yet it is precisely in this area that we, as a nation, have been weakest. We have been strong in applied science and in technology, but in the past we have relied largely on Europe for basic knowledge.

Government Should Provide Funds for Pure Research

Pure research is arduous, demanding, and difficult. It requires unusual intellectual powers. It requires extensive and specialized training. It requires intense concentration, possible only when all the faculties of the scientist are brought to bear on a problem, with no disturbances or distractions.

Some of the fundamental research necessary to our national interest is being undertaken by the Federal Government. The Government has, I believe, two obligations in connection with this research if we are to obtain the results we hope for. First, it must provide truly adequate funds and facilities. Second, it must provide the working atmosphere in which research progress is possible.

As to the first point, the Government is developing impressive programs in many scientific fields. Fundamental research is being carried on for the National Military Establishment in the laboratories of the armed forces, of industry and of our universities.

The Atomic Energy Commission has been pushing its extensive research. The National Advisory Committee for Aeronautics has expanded its many aeronautical developments. The Federal Security Agency has engaged in extensive medical studies, in its own laboratories like the National Institute of Health, and through grants to colleges and universities.

Other Federal agencies, such as the Departments of Commerce, of Agriculture and of the Interior, have pursued vigorous programs. The Inter-Departmental Committee on Scientific Research and Development, appointed by me last March, aids in coordinating the Government's many research programs. I sincerely hope that these programs will be further developed and coordinated by the early passage of a National Science Foundation bill.

Scientists Should Be Encouraged To Work for Government

The second obligation of the Federal Government in connection with basic research is to provide working conditions under which scientists will be encouraged to work for the Government. Scientists do not want to work in ivory towers, but they do want to work in an atmosphere free from suspicion, personal insult, or politically motivated attacks.

It is highly unfortunate that we have not been able to maintain the proper conditions for best scientific work. This failure has grave implications for our national security and welfare.

There are some politicians, and I could name them, who are under the impression that scientific knowledge belongs only to them. . . . The rumor has come to me that one of them even made the remark as to why we let the scientists know anything about the atomic bomb.

This situation has been of increasing concern to me. It was highlighted by a telegram I received last week from eight distinguished scientists. These men expressed their alarm at the deterioration of relations between scientists and the Government because of the frequent attacks which have been made on scientists in the ostensible name of security.

The telegram points out that the actions of certain groups are "creating an atmosphere that makes men shun Government work," and that the Federal Government is losing the services of excellent scientists because they have been looked upon from certain quarters as "men not to be trusted."

The telegram points out that scientists fully appreciate the need for sensible security measures. But scientists very understandably are reluctant to work where they are subject "to the possibility of smears that may ruin them professionally for life."

That telegram was a balanced and sober presentation of a vital problem that concerns every American.

Continuous research by our best scientists is the key to American scientific leadership and true national security. This indispensable work may be made impossible by the creation of an atmosphere in which no man feels safe against the public airing of unfounded rumors, gossip and vilification.

Such an atmosphere is un-American, the most un-American thing we have to contend with today. It is the climate of a totalitarian country in which scientists are expected to change their theories to match changes in the police state's propaganda line.

Smear Campaigns Obscure Achievements of Atomic Scientists

I hardly need remind this association that it is primarily to scientists that we owe the existence of our atomic energy enterprise.

It was the scientists who first saw the possibility of an atomic bomb. It was the scientists who proved the possibility. It was the scientists who first saw the need of security measures, and who on their own initiative clamped down a tight lid of secrecy on all experiments.

It must not be forgotten for a moment, and certainly it must not be obscured by any smear campaign, that but for the scientists we would have no atomic energy program.

We are only in the beginnings of the atomic age. The knowledge that we now have is but a fraction of the knowledge we must get, whether for

peaceful uses or for national defense. We must depend on intensive research to acquire the further knowledge we need. We cannot drive scientists into our laboratories, but, if we tolerate reckless or unfair attacks, we can certainly drive them out.

These are truths that every scientist knows. They are truths that the American people need to understand.

Science has no political affiliation. Concern for our national security is non-partisan. Sober recognition of scientific research as the basis of our future national security should certainly be non-partisan. All Americans have a solemn obligation to avoid those methods and procedures which are impeding scientific research—whether adopted mistakenly with good intent, or advocated in the name of security by men with other axes to grind and red herrings to drag around.

Need for Development of the Social Sciences

My emphasis tonight has been on the physical and biological sciences. These are obviously in the forefront in terms of our industry and technology. But the social sciences and related fields are at least as important in the present stage of human affairs.

The physical sciences offer us tangible goods; the biological sciences, tangible cures. The social sciences offer us better ways of organizing our lives. I have high hopes, as our knowledge in these fields increases, that the social sciences will enable us to escape from those habits and thoughts which have resulted in so much strife and tragedy.

I am sincerely hoping that we will develop those social sciences, and that we will develop the atomic energy release for the welfare of mankind, so that, as I said a while ago, we will be living in the greatest age the world has ever seen, and I am sure that is what we are going to do before we get through.

Now and in the years ahead, we need more than anything else the honest and uncompromising common-sense of science. Science means a method of thought. That method is characterized by open-mindedness, honesty, perseverance, and, above all, by an unflinching passion for knowledge and truth. When more of the peoples of the world have learned the ways of thought of the scientist, we shall have better reason to expect lasting peace and a fuller life for all.

Public Employment or Public Pillory?

DAVID E. LILIENTHAL

Mr. Lilienthal affirms his belief in the ability of the American people to evaluate justly recent investigations into alleged "Un-American" activities of scientists. He finds in this belief the answer to the doubts of those scientists who feel that government employment may entail unwarranted defamation. We give here the full text of Mr. Lilienthal's speech delivered before the American Association for the Advancement of Science in Washington on September 16.

It is never pleasant to be the bearer of bad tidings. But there is a disturbing situation that threatens the success of the atomic energy enterprise of this country.

The fact can be simply stated: It is the increasing unwillingness of specially qualified (and badly needed) scientists, engineers, and management experts to engage in work for the Government of the United States.

This is a dangerous situation.

It imperils some of the broadest, deepest and most immediate interests of the people of our country. Should it continue it is clear that it will adversely affect the morale of the large number of men and women all over the country who are working for the Government, including those who are presently engaged in atomic research, development and production—a quite exceptionally able and devoted company of people, in my opinion. It is bound to affect their willingness to continue to contribute their talents and enthusiasm to this vital enterprise.

It is an unhappy aspect of this picture that it should develop at the very time when this nation's extensive atomic energy undertaking has attained considerable momentum, momentum greater than any that has existed since the end of the war. It is ironic that this danger should become acute at the time when specific achievements have just been chalked up to the credit of this country's technical management forces engaged in atomic work—achievements, I may add, that are of importance to every man, woman and child in this country.

A healthy atomic energy program simply cannot stand still. It goes ahead, with greater and greater momentum, or it goes to pot. It moves forward, to the answering of new questions, the solving of new problems, the uncovering and development of new knowledge—or it deteriorates. To move ahead it is imperatively necessary that the people of the United States be able to enlist in their service, at once, more individuals of exceptional talent in the fields of science, engineering and management; and it is imperative that this country be able to retain the enthusiastic service of the many unusually qualified people who now are at work on atomic energy, in the nation's universities, industries, and on the Commission's staff.

We must, it seems to me, all get clearly in mind two propositions:

First: America's leadership in this new and fateful field of knowledge requires a stupendous effort. The notion that our atomic energy leadership depends upon a "secret formula," locked in a vault, is nothing less than a gigantic hoax upon the people of this country.

Our leadership depends upon developing new knowledge, and the new applications of that knowledge. Guards, and fences, and investigators—all these have a place, an important place. But guards and fences and investigators do not develop new knowledge about atomic energy, nor new applications of knowledge. And our position in the world and our progress in this field requires that we know more and more, and that we know it first.

Second: To know more and more, to know it fast and to know it first—this takes people, a particular kind of people. Good intentions, resounding speeches, expensive plants—none of these by themselves will do the job. We must have the very best qualified people in the United States. This is a relatively small company. Not a few of these the atomic energy enterprise does have, and it is to this fact that the considerable achievements of recent months can be attributed. But we must have more of them, and we must have them right away. Otherwise we face the imminent threat of stagnation. It is this that makes the present situation grave and ominous.

What are the reasons for this situation? Why this mounting difficulty in persuading some of America's finest talents to make their services available to their Government? Why the growing reluctance of institutions and people to become involved in secret work?

There is a complex of reasons, of course, this is always true in any problem in which human beings are concerned.

I recognize that for a long time there has been a reluctance to enter Government service, for a variety of reasons which have been discussed many times. But that service has now taken on an extra, an added unattractiveness, an added disability: the risk of undeserved injury to a man's good name, his professional standing and his peace of mind through anonymous villification, through attacks from what may be petty or prejudiced or malevolent sources.

Piled on top of all the other familiar disabilities of public employment, this often makes work for the Government appear as something to be shunned. Public employment has become, in a very real sense, a hazardous occupation. The possibility of public pillory, so often unjustified and beyond immediate redress, does indeed cast a shadow of fear over public service. The growing concern of scientific and technical and managerial people is evident on every hand. The trend shows that as between private industry, educational institutions, and Government, Government is regarded as the least desirable employer to most scientists. Leading scientific and technical people have warned that the sources of talent are being closed to Government.

I am not here to seek to persuade you and your colleagues in science, engineering, and management that there is no basis whatever for your fears. That would be sheer wishful thinking.

These are fears that are not felt by scientists and engineers alone. Nor are they felt only in respect to secret atomic energy work. They are unhappily widespread. It is not, however, of the general problem of which I speak, but of the specific consequences of these fears upon the health and vigor of the atomic energy program of our country.

But granted that all the hazards I have just described are real there is a larger reality. It is this: if such damaging and painful occurrences should become common then inevitably self-respecting men will refuse in ever increasing numbers to work for their Government, and this Government, and therefore this Nation, will be in grievous trouble.

This is a situation none of us wants to contemplate. Nor, I believe, is it inevitable. But it is only by laying this situation before the country with candor and forthrightness that the answer can be found.

For I have faith that there is an answer.

That answer lies in re-assertion of our basic confidence in the level-headedness, the fairness and the hard common sense of the American people as a whole, and of the fairness and responsibility of the overwhelming majority of the press and radio.

That answer lies in the development of procedures such as your Atomic Energy Commission has been working out that will ferret out the relatively few unreliable and disloyal individuals, without at the same time subjecting decent, conscientious and utterly loyal citizens to unwarranted fears and terrible injuries.

That answer lies in a faith all of us share that democracy is worth more to us as individuals than the price—the not inconsiderable price—that it sometimes exacts of those who, entering the service of their Government, risk the hazards of abuse and distortion and defamation.

Now, neither the Atomic Commission, nor any other body, can guarantee that individuals will never be subjected to unfair or unjustified criticism. But there is a reasonable way to deal with the problem of assuring the United States loyal and efficient public servants. In its policies and practices the Atomic Energy Commission has made a determined and a not unsuccessful effort, to deal sensibly with this problem. The American people, we believe, do not think it makes sense to burn the barn in order to catch the rats.

The Commission's course is based upon two premises:

The first is that we must recognize that the world being what it is there are some people who just have no business in the atomic energy program.

Hence every employee of the Commission, and those contractors' employees who have access to "restricted data" (the statutory term for a large body of secret information) is investigated by the FBI before he is granted a final security clearance. The investigation is provided for by the Atomic Energy law, and there has been no suggestion that I know of from any responsible source that the law be amended to eliminate this provision. Surely such a precaution is an obviously reasonable one.

The Commission's course is also based on the belief that there is a reasonable way to handle security problems, a way that provides a considerable measure of protection to the individual, and at the same time protects the interests of the nation in its own security.

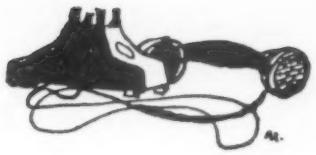
We have been working on the development and improvement of procedures to accomplish this. For example, we have set up an interim procedure under which any person whose loyalty, character, and associations have been questioned, in connection with atomic energy employment, is provided with the fullest possible statement as to unfavorable information about him. There is careful provision for hearings and for appeal from decisions adverse to the individual.

Nevertheless, the best procedures in the world cannot possibly provide an absolute assurance against unfair criticism or attack. Indeed, whether the criticism be fair or unfair, whether it be justified or unjustified, the right to criticize those entrusted with public responsibility lies at the very root of our conception of democracy. The real assurance of fairness rests upon the basic good judgment and the conscience of the American people. Who is there, thinking back over the history of this country, who can doubt the essential fair-mindedness and common sense of the people? Who, looking about him, seeing his neighbor, or the man at the next machine or desk, who will be misled into thinking that a noisy few speak for all of us?

But even when the current tension has eased there will still be occasional abuse, occasional unfair accusations against those in the public service. For this has happened in the past, and will certainly happen in the future. Let's not ask for the impossible, nor be perfectionists. This is part of the price we pay for the great benefits of a free society.

Viewed from such a perspective is this too high a price? I believe it is not. I am confident that the men and women of our generation believe it is not too high a price.

A MESSAGE TO THE WORLD CONGRESS OF INTELLECTUALS



Albert Einstein

The following is the correct and full text of Dr. Einstein's message to the World Congress of Intellectuals which met in Breslau during August. Dr. Einstein released this message in Princeton on August 28 after the publication of a completely disimilar message in Poland, distinguished from the original chiefly by its brevity and the omission of any mention of Dr. Einstein's strong recommendation for a world government. The message attributed to Dr. Einstein in Poland appears on Page 320.

We meet today, as intellectuals and scholars of many nationalities, with a deep and historic responsibility placed upon us. We have every reason to be grateful to our French and Polish colleagues whose initiative has assembled us here for a momentous objective: to use the influence of wise men in promoting peace and security throughout the world. This is the age-old problem with which Plato, as one of the first, struggled so hard; to apply reason and prudence to the solution of man's problems instead of yielding to atavist instincts and passions.

By painful experience we have learnt that rational thinking does not suffice to solve the problems of our social life. Penetrating research and keen scientific work have often had tragic implications for mankind, producing, on the one hand inventions which liberated man from exhausting physical labor, making his life easier and richer; but on the other hand, introducing a grave restlessness into his life, making him a slave to his technological environment, and—most catastrophic of all—creating the means for his own mass destruction. This, indeed, is a tragedy of overwhelming poignancy.

However poignant that tragedy is, it is perhaps even more tragic that, while mankind has produced many scholars so extremely successful in the field of science and technology, we have been for a long time so inefficient in finding adequate solutions to the many political conflicts and economic tensions which best us. No doubt, the antagonism of economic interests within and among nations is responsible to a large extent for the dangerous and threatening condition in the world today. Man has not succeeded in developing political and economic forms of organization which would guarantee the peaceful co-existence of the nations of the world. He has not succeeded in building the kind of system which would eliminate the possibility of war and banish forever the murderous instruments of mass destruction.

We scientists, whose tragic destination has been to help in making the methods of annihilation more gruesome and more effective, must consider it our solemn and transcendent duty to do all in our power in preventing these weapons from being used for the purpose for which they were invented. What task could possibly be more important for us? What social aim would be closer to our hearts? That is why this Congress has such a vital mission. We are here to take counsel with each other. We must build spiritual and scientific bridges linking the nations of the world. We must overcome the horrible obstacles of national frontiers.

In the smaller entities of community life man has made some progress toward breaking down anti-social sovereignties. This is true, for example, of life within cities and, to a certain degree, even of society within individual states. In such communities tradition and education have had a moderating influence and have brought about tolerable relations among the peoples living within those confines. But in relations among separate states complete anarchy still prevails. I do not believe that we have made any genuine advance in this area during the last few thousand years. All too frequently conflicts among nations are still being decided by brutal power, by war. The unlimited desire for ever greater power seeks to become active and aggressive wherever and whenever the physical possibility offers itself.

Throughout the ages this state of anarchy in international affairs has inflicted indescribable suffering and destruction upon mankind; again and again it has depraved the development of men, their souls and their well-being. For given times it has almost annihilated whole areas.

However, the desire of nations to be constantly prepared for warfare has still other repercussions upon the lives of men. The power of every state over its citizens has grown steadily during the last few hundred years, no less in countries where the power of the state has been exercised wisely than in those where it has been used for brutal tyranny. The function of the state to maintain peaceful and ordered relations among and between its citizens has become increasingly complicated and extensive, largely because of the concentration and centralization of the modern industrial apparatus. In order to protect its citizens from attacks from without a modern state requires a formidable expanding military establishment. In addition, the state considers it necessary to educate its citizens for the possibilities of war, an "education," not only corrupting to the soul and spirit of the young, but also adversely affecting the mentality of adults. No country can avoid this corruption. It pervades the citizenry even in countries which do not harbor outspoken aggressive tendencies. The state has thus become a modern idol whose suggestive power few men are able to escape.

Education for war, however, is a delusion. The technological developments of the last few years have

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THE CHALLENGE OF THE ATOMIC AGE

Thomas E. Dewey

In the August issue of the BULLETIN, we pointed out the absence of recommendations concerning atomic energy in the platform of the Republican Party. We therefore consider it particularly important to give in full the text of the Republican candidate's first public statement concerning atomic energy—a speech given at Phoenix, Arizona on September 23.

These are stirring times to be an American. And I don't know any more stirring place for an American to be than here in your great Southwest. This is still pioneering country. Here nobody has to argue with anybody else about looking to the future. You're looking that way already. You know that your future is still ahead of you. And that's exactly what I believe about every part of our country. That's what I've been saying to our people.

Ours is a magnificent land. Every part of it. Don't let anybody frighten you or try to stampede you into believing that America is finished. America's future—like yours in Arizona—is still ahead of us. Many stirring things are happening here in the southwest.

Tonight I want to talk to you particularly about one of them across the border in your neighbor state. On the night of July 16, 1945, American scientists exploded the first atomic bomb. Today, the Government has built there a great factory and research center to carry forward and improve our knowledge and production.

That July night, three years ago, was a momentous date in human history, what happened there was nothing less than this: man took the lid off a whole new layer of the universe. With immense labor, immense courage and resourcefulness and with the creative genius known only to the free peoples, our scientists laid their hands on the ultimate physical force and began to harness it for our use. That fact has already changed the world in which we live. It will unbelievably change the world in which our children live. That much we know. But one thing, the one all important thing, we do not know. We do not know how the world will be changed, whether for evil or for good.

There is no middle ground. The atomic age will be one of unimagined blessing or of unimagined disaster. We do not know which it will be. This is for us, for mankind to determine. It may be our final choice. That choice is our challenger. As we face that challenge and take stock of our opportunity, we will know that the backwards look won't do. The backward road won't do.

We are living in a new age. This age requires of us new wisdom new courage and a new vision. I propose that we summon such wisdom, courage and vision and, with faith, not fear, go forward together.

We think of atomic energy in terms of the bombs. But, in truth, to speak about atomic energy only in terms of the atomic bomb is like speaking of electricity and ignoring everything about it except the destructive force of a bolt of lightning. Atomic energy should be the greatest of all productive forces for peaceful progress. We have just begun, a very little bit, to look behind the curtain and see something of this promise of the future.

It may be that, with radio elements cheap and plentiful, doctors working in our laboratories will be able to solve at last, the mystery of the scourge of cancer and go on from there to find a cure. All of the food we eat, most of the fuel and power we use, come from the capacity of growing things, leaves and grass and grains. To make sugar, starch and cellulose out of air, water and sunlight, that's a miracle no human chemist has yet been able to duplicate. But, thanks to atomic science, we seem to be close to solving that mystery. When it's solved, it may even be that we will have found a way to end forever the earth's shortages of food.

We're running short of oil in the United States this year, for the first time in our history. We are importing more oil than we are exporting. But coal we have in great abundance. And scientists tell us that through atomic research we may one day so greatly step up the artificial production of oil from coal as to overcome our shortage. Looking ahead, where scientists are beginning to explore, it may be that atomic power plants will provide all the fuel we'll need for those areas of our country which are short of fuel. I even heard the serious scientific suggestion made the other day that once we've mastered some more of the technical problems of atomic power we could put a power plant in the arctic so that people could live there in comfort and search out the mineral resources that may lie hidden in those frozen regions.

I am not a scientist. I can't tell you how soon these things will happen. But we know already that they are not idle dreams or something out of Buck Rogers. They are part of the future which—one day—m a n w i l l realize.

If we can win the peace if we rid the world of that overshadowing threat of war, then—with this new power in our hands—we can make the peace. We win an era of human betterment and progress such as the world has never seen.

Atomic science, which has made the prospect of war more terrible, has at one and the same time filled the peace we are striving for with the prospect of vastly increased blessings. To bring these good things to pass we must win the peace and we have not yet won it. Because of that unhappy fact our thinking about atomic energy and the world of our scientists and technologists has been largely concentrated on its military uses. So long as the danger of war hangs over us that necessity will continue. Any other course would invite disaster for us and for mankind. It would increase the likelihood of war, not diminish it.

And you can be very sure of this. You can be very sure that many mil-

lions of freedom-loving, peace-seeking people in the world are giving thanks tonight that the atomic secret for the present at least is America's secret. They pray that it will remain America's secret. These millions of people know that these atomic weapons in our hands are in safe hands. They know we will never use them as instruments of aggression against any people. They know that, so long as this secret is our secret it will be a powerful restraint upon the aggressions of others.

The world knows these things because it knows America. It knows them because, in regard to this problem America has already proved its good faith. For more than two years the United States labored tirelessly through the United Nations to find effective means for the international control of atomic instruments of war. We hoped that in this way the world could turn its efforts from planning new instruments of destruction and begin to harness this vast force for p e a c e, but our best efforts were blocked. They were blocked at every turn by the oposition and the repeated vetoes of the Soviet Union.

Today, as the United Nations meets in Paris to face the problems of this troubled time, this subject is high on its agenda. We are determined that this great new force be turned into an instrument of peace not of war.

Until other nations are prepared to act in like good faith we will safeguard this decisive secret. Until the threat of aggression and war is removed from the world we will back the kind of research that is now going on here in the southwest and in other parts of our country. We will back it to the hilt. We will do that—not as an act of ill-will against any people. We will do it for the protection and the safety of our own freedom. We will do it so that peace and freedom for people everywhere can continue to have this powerful support from an America which desires these things above all others.

But the challenge and the opportunity that now confront us are not before our government alone. They challenge all of us. The genius that split the atom was not furnished by government. The technological knowledge, skill and know-how which built the vast plants for the production of the atomic bomb and which produced it were not furnished by government, either. These triumphs were a triumph of our American system, our American way of life—for our belief in what man can do if he is free to tackle his job without fetters or fears and unhampered by the dead hand of political authority.

If we are to realize the full promise of the atomic age we will need the full employment of the genius and skill of our free America. Today nearly every aspect of atomic work in our country is, by law, a government monopoly. This monopolistic power is the greatest and most far-reaching in our history. In those respects in which this monopoly is necessary to safeguard this secret and to develop its military uses, it must be maintained at all costs. But with this precaution for our security: It is perfectly clear that atomic progress cannot continue to be left exclusively to the government.

You and I have heard about the dead hand of government. We have seen it. We know that if America's industrial progress had been left solely to government there would have been very little progress indeed. If it had been up to Washington to develop, let us say, our electrical industry, you can be pretty sure we'd still be using kerosene lamps. And if our transportation system had been left to the government to develop, we would probably still be getting around by horse and buggy.

We learned these lessons a long time ago. Some nations h a v e n ' t learned them yet. But make no mistake about it they will. We know in America what government can do and we know what it cannot do. We know what the enterprise, initiative and creative powers of our people can do. We know this too well to leave the possibilities of the atomic age solely in the hands of a government monopoly. I propose that we protect this weapon of our defense with every means and that we develop it further with every means. And then I propose that we go on from there and give American initiative and skill a chance to turn this power to production and peaceful account.

We cannot do this job alone. We did not split the atom and make the atom bomb alone. In doing these things we were immensely aided by scientists, men and women who had fled from Europe's dictators to a haven in America. Here in this free land they pooled their ideas with ours and out of our common effort this thing was achieved. If the atomic future is to be one of promise rather than disaster, then mankind must summon its moral resources and make a similar common effort in the realm of the spirit. Man has learned to deal with nearly all of nature except human nature. We have explored the universe, but we do not know ourselves. We have come into possession of vast knowledge but we have not yet acquired wisdom or understanding. That is the real challenge. That is our most momentous opportunity:

To match our physcial mastery of the universe with the moral and spiritual mastery of ourselves. Nothing less than that will fit us for the atomic age. Only that can make the atomic age fit for men to live in.

GOVERNOR DEWEY AND THE ATOM

The following editorial appeared in the New York Times on September 25.

The statesmanship in Governor Dewey's first speeches in the West lapsed a little in the comments he made at Phoenix Friday evening on atomic energy. In the first place, he gave an inaccurate picture of the Manhattan Project when he said that "the genius that split the atom was not furnished by government." Of course government recruited most of the needed genius from private life. Nevertheless, it did set the project up and it did achieve in this way a swift progress not otherwise attainable. In the second place, Mr. Dewey said that after every precaution has been taken for our national security "atomic progress cannot be left exclusively to the Government." It isn't, even now. Our Atomic Energy Commission is sending out thousands of isotopes for use in p r i v a t e enterprise—in hospitals, in laboratories, in industries, even on farms.

These inaccuracies are not too important. What is important is that Governor Dewey appeared to forget the essentials of the Baruch Plan for the international control of fissionable materials. Under such a plan a United Nations agency would own or control all such materials, regulate all private establishments using them, carry on basic research and, indeed, keep its heavy thumb on the whole enterprise. Mr. Dewey compared atomic power with electric power. In no foreseeable

time could the two energy sources be on the same footing. We may not like the word, but this country, for good reasons is committed to a species of international socialism in the atomic field. It is not Marxian. It is not dogmatic. Nevertheless, it will restrain free competition and the laws of the market. For our own safety it must do so.

We believe Governor Dewey may wish to correct the impression his speech has made. We believe he intends, if elected, to proceed with the essentials of the Baruch Plan. He should say so.

Bulletin Requests Clarification From Governor Dewey

The following wire was sent by the BULLETIN to Governor Dewey's special train on September 27. No reply was received up to the time this issue went to press.

". . . . We would be honored and grateful if you could wire statement clarifying your suggestion for discontinuing government monoply of atomic energy. A New York Times editorial on September 25 commented: 'We believe Governor Dewey may wish to correct the impression his speech has made. We believe he intends, if elected, to proceed with the essentials of the Baruch plan. He should say so.' The American Plan for international control provides for continued far reaching government monoply of atomic energy research and development which would be transferred from the American government to the international agency as a permanent safeguard to peace. We feel it extremely important that your views in this connection be known now and are holding up publication of our October issue in the hope that you will reply by return collect press rate."

Author of Atomic Energy Act Comments on Governor Dewey's Speech

Brien McMahon

The following statement was sent to us by Senator McMahon in response to our request for his comments on Governor Dewey's speech

Governor Dewey's speech is vague, in many ways contradictory, and seemingly calculated to leave the American people in doubt as to how he would modify their atomic energy project. The speech can be interpreted as meaning that Mr. Dewey wants to place in the hands of private corporations a force equal to the possession of a private army or navy. Apparently he wants private firms to produce fissionable material. Apparently he misunderstands the meaning of atomic energy, the manner in which it was developed, and the provisions of the McMahon Act for its control.

These conclusions follow from the patently false analogies which the governor uses to support his theses that "the dead hand of government" may hobble atomic development. He compares the growth of this unique force to the development of electric power and transportation. Thus he implies that atomic energy is "just another source of power"—an error paralleling the naive notion that the atomic bomb is "just another weapon." Of course, electric power and transportation were developed largely by private industry. But the explosive release of atomic energy became possible through the combined efforts of scientists, technicians, engineers, the armed forces, and many other groups —all working in unison for one great objective under governmental direction. Private corporations played a major role, but they were not the whole team by any means. Certainly "the dead hand of government" did not retard development of the bomb. On the contrary, the United States would not possess the bomb today if it had not been for the government's initiative. Governor Dewey's speech implies that, under the existing atomic control act, private industry has been barred from participation in our present program; and this, in turn, suggests that he had not been correctly informed of the facts. Our great plants at Oak Ridge and Hanford, and many of the new development projects elsewhere, are being operated by private corporations at substantial profits. But they are functioning under over-all government supervision and coordination and under government security regulations. Thereby the nation minimizes chances of an intelligence leak. No different scheme would afford the same protection.

Governor Dewey further misses the fact that universities, private laboratories, engineering and industrial firms, health organizations, and the like are all cooperating effectively through the present concerted development program. In this fashion we are achieving that teamwork which is so vitally necessary—the same kind of teamwork which originally produced the bomb. Let me emphasize that the genius of private enterprise is being utilized, that it does have ample opportunity to accelerate atomic progress.

I thoroughly disagree with Governor Dewey's implied thesis that American industry will only respond to the lure of unlimited profits. Scientists, administrators, and other individuals seem perfectly willing to work for reasonable compensation: and corporations are not entitled to preferential treatment. In this connection, I might point out that liberal provision for rewarding inventors, prospectors, and others who contribute to atomic development is contained in the existing act.

The day may ultimately come when atomic energy will be used to power locomotives, aircraft and ships, and when atomic power will pervade the entire fabric of our economic life. The present act foresees the coming of this day and contains carefully worded stipulations to assure that government will not unduly handicap private enterprise. I was astonished when the Republican party failed even to mention atomic energy by name in its campaign platform. At the time, I assumed that this omission was unintentional—that the Republicans simply had little conception of the role of atomic energy is destined to play. But now it must be feared that the omission was deliberate.

This omission was foreshadowed in the 80th Congress when the Republican Senate reduced the terms of the present members of the atomic energy commission to two years. More recently, certain proposals have been advanced to subvert the present act—by restoring all military production and custody of atomic weapons to the Army and by converting the Atomic Energy Commission into little more than a mere licensing agency for private firms. On the very day before Governor Dewey spoke, an article in the New York Star alleged that these proposals command the support of various prominent Republicans, including the Governor himself. Conse-

quently, his speech fits into a pattern which gives cause for genuine concern.

What is more, Mr. Dewey's remarks cast a threatening shadow over the future of international control. From the beginning our official position has been that a United Nations atomic developments authority must itself operate "dangerous" plants. If such plants were handed over to private firms, effective international control might prove to be impossible. Yet Mr. Dewey declares that he favors the official American control proposals. Because of this ambiguity alone, he owes it to the American people to clarify his stand. The Republican candidate has raised the most serious political issue not only of this campaign but of this generation. The fact that, under one interpretation of his statements, he projects his ideas into the vague future does not lessen the grave significance of what he suggests. The original Domestic Act was conceived and approved by Congress in the spirit of non-partisanship. Most of us hoped that it would always be considered on this plane. Governor Dewey, unfortunately, has seen fit to inject the issue into this campaign. Now that it is in politics, it must undergo the most careful and searching scrutiny by the American people.

Einstein's Message to World Congress of Intellectuals

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created a completely new military situation. Horrible weapons have been invented, capable of destroying in a few seconds huge masses of human beings and tremendous areas of territory. Since science has not yet found protection from these weapons, the modern state is no longer in a position to prepare adequately for the safety of its citizens.

How, then, shall we be saved?

Mankind can only gain protection against the danger of unimaginable destruction and wanton annihilation if a supra-national organization has alone the authority to possess these weapons. It is unthinkable, however, that nations under existing conditions would hand over such authority to a supra-national organization unless the organization would have the legal right and duty to solve all the conflicts which in the past have led to war. The functions of individual states would be to concentrate more or less upon internal affairs; in their relation with other states they would deal only with issues and problems which are in no way conducive to endangering international security.

Unfortunately, there are no indications that Governments yet realize that the situation in which mankind finds itself makes the adoption of revolutionary measures a compelling necessity. Our situation is not comparable to anything in the past. It is impossible, therefore, to apply methods and measures which at an earlier age might have been sufficient. We must revolutionize our thinking, revolutionize our actions, and must have the courage to revolutionize relations among the nations of the world. Cliches of yesterday will no longer do today, and will, no doubt, be hopelessly out of date tomorrow. To bring this home to men all over the world is the most important and most fateful social function intellectuals have ever had to shoulder. Will they have enough courage to overcome their own national ties to the extent that is necessary to induce the people of the world to change their deep-rooted national traditions in a most radical fashion?

A tremendous effort is indispensable. If it fails now, the supra-national organization will be built later, but then it will have to be built upon the ruins of a large part of the now existing world. Let us hope that the abolition of the existing international anarchy will not need to be bought by a self-inflicted world catastrophe the dimension of which none of us can possibly imagine.

The time is terribly short. We must act now if we are to act at all.

Senator Vandenberg Reaffirms Support of Civilian Control

The NEW YORK STAR of September 23 reported Walter M. DeCew, editor of NUCLEONICS, as saying that his proposed bill to replace the McMahon Act (See BULLETIN, Vol. 4, No. 9) had the support of Governor Dewey and "such Republicans as Representative Joseph P. Martin, of Massachusetts; Senator Arthur H. Vandenberg, of Michigan; and Senator John W. Bricker, of Ohio . . . ." Mr. DeCew is also quoted as saying that the new bill is now being shaped by attorneys of corporations which "have been unable to do business with the Atomic Energy Commission because it's a socialistic agency." Because Senator Vandenberg's support of the Atomic Energy Act of 1946 was one of the important factors leading to its ultimate passage in Congress, the Bulletin felt it should obtain a clarification of his present attitude. The BULLETIN therefore wired Senator Vandenberg on September 27 and received his reply the following day. The texts of both wires follow.

SENATOR ARTHUR H. VANDENBERG:

The New York Star of September 23 quotes DeCew, editor of NUCLEONICS as saying that you endorse his proposed new legislation to replace the Atomic Energy Act. We would greatly appreciate confirmation or denial of this statement. If you confirm statement would be most honored and grateful if you would at the same time give us your reasons for your change in attitude on this question. DeCew legislation predicated on failure of international control. Do you share this assumption?

—BULLETIN OF THE ATOMIC SCIENTISTS

BULLETIN OF THE ATOMIC SCIENTISTS:

Answering your wire, I have no recollection of any correspondence with DeCew although this is not conclusive because my files are in Washington. McGraw Hill issued a statement September 23rd reading as follows: "A New York Star report that the McGraw Hill Publishing Company claims support of Senator Vandenberg for atomic energy legislation proposed in one of its magazines is untrue and such a claim would be unsupported in fact" Frankly, I have no recollection of DeCew's proposals. Therefore, I am not in a position to discuss them. But I am in a position to say that I have not changed my mind in any degree regarding basic civilian control of atomic energy. I have no intention of supporting a general replacement of the Atomic Energy [Act] although some improvements undoubtedly are possible as a result of our experience. There must be some mistake about the true purport of any letter I may have written on the subject.

—SENATOR ARTHUR H. VANDENBERG

FREEDOM DEMANDS RESPONSIBILITY

Cuthbert Daniel and Arthur M. Squires

The general question as to whether or not scientists have a unique civic responsibility for the uses made of their discoveries was discussed in a symposium centering around P. W. Bridgman's article "Scientists and Social Responsibility" printed in our March issue. We initiate here a second symposium centered around Drs. Daniel and Squires' proposal that scientists and engineers should refuse to participate in weapons research and development. Comments by Eric Ashby, A. P. Lerner and A. D. Ritchie follow, along with some communications from French scientists bearing on the same question, although not expressly written for the symposium. The November issue will carry a second series of comments on this question by other prominent natural and social scientists. Dr. Daniel is a consulting statistical engineer for Hydrocarbon Research, Inc. and the Bakelite Corporation; Dr. Squires is a physical chemist at Hydrocarbon Research, Inc. The authors were both employed by The Kellex Corporation in the construction of the Gaseous Diffusion Plant at Oak Ridge.

Science sans conscience
n'est que ruine de l'ame.
—Rabelais.

This article is addressed primarily to American scientists and engineers who now work on weapon projects, as did we until recently. It can be taken for granted that most of these men don't really like their job of developing more efficient ways of killing people. This is also the case, we believe, for Russian scientists and engineers, and for technical men working on weapons all over the world. Each group continues because other groups continue. Each group's behavior is partly the cause and partly the effect of the actions of other groups. Each group prepares for war because "that is what the other fellow is doing." Often stimulated more by its imaginings of the other fellow's activities than by its knowledge of the case, each group turns its skill to more and more effective weapons—more destructive, more terrorizing, more horrible. But the men who are the key figures in this widening circle of horror are for the most part decent men, who would rather work on useful or even useless projects; who are sincerely devoted to peace; who would deeply resent comparison with the butchers of Belsen and Oswiecim.

American scientists and engineers are not automatons; their sincerity and fundamental decency cannot be called into question. And yet, under far less compulsion than the German scientists, they engage in the business of preparing death for millions of innocent people. It is the *situation* that is wrong. The least we can learn from this fact is that the will of individuals, even of a key group of individuals, may be entirely irrelevant—not only to the broad course of events but to the actions of the group in question: decent men prepare murder.

Most American scientists feel that the trouble with the situation is not here but in Russia. "If the Russians would stop, we would gladly stop, too." Most Russian scientists undoubtedly have similar feelings, but locate the trouble in capitalist, "imperialist" United States. Up to this point, the situation is almost exactly symmetrical. Assymetry enters with the consideration of what can be done.

The stultifying round of recrimination and mutually kindled suspicion cannot be broken by symmetrical steps. No serious communication between American and Russian scientists is conceivable, and so there can be no simultaneous escape from the coils of fear. Even if communication were possible, no serious act of moral leadership could decently be asked of Soviet scientists. Their "situation" is infinitely worse than our own. Is there then no way for American and Soviet scientists to break the vicious circle?

American scientists can study, discuss, and act on this question; Soviet scientists cannot. Freedom and responsibility go hand in hand. Can American scientists, without the support of their Soviet colleagues, make an effective move for peace?

We are not among those who view the mere existence of weapons as the principal cause of war. But few readers will subscribe to the contrary proposition; that a high level of military preparedness makes war less likely. Even without an analysis of the causes of the deadlock between the United States and Russia, it is apparent that the arms race is the most concrete objective result of the deadlock. American scientists and engineers working on weapon development play a decisive role in the arms race. Can they use this role constructively?

To answer this question by suggesting moves and stratagems is not our purpose in this article, but we believe there is a way in which American scientists and engineers can start toward an answer. They must ask themselves whether their present professional activities contribute to peace or war. They must submit to scrutiny the motivations of their present activities. They must decide whether they should accept responsibility for the use of the results of their studies, or whether they dare delegate this responsibility to other men.

Military Strength Versus National Security

The political leaders of this country have elected to stake its security on military superiority—the most of the latest and best. No longer, however, do they use the word "defense" in its dictionary sense—the new weapons are not weapons of defense; they are w e a p o n s for counter-attack. America's military establishment now exists not to protect civilians from inevitable slaughter at the outset of a war, but to deliver a crushing counter-blow. It is argued that overwhelming military superiority will deter Russian attack because of fear of retaliation.

Many scientists recognize the tragic wrong-headedness of this argument. The scientists and engineers in the Federation of American Scientists have long agreed that military strength is not synonymous with national security. It is only one step

from this entirely true but negative proposition to the constructive notion that *national military strength will soon be incompatible with national security*. Very soon a country's military strength will be measured in the kind of weapons it possesses, not in numbers of them. One thousand atomic bombs are probably the military equal of ten thousand. The development of new weapons for America's arsenal hastens the day when the same weapons are produced by Russia and others. In this way, the Manhattan Project, conceived in a fear which had little foundation, hastened production of the atomic bomb by many years. As stockpiles of new, more horrible weapons mount higher, a wider circle of social activity will come under dictatorial control by the military. The fear of retaliation will be overcome by the temptation, and the political power, to strike the first blow—or by the temptation to end the intolerable tension with a dishonorable bargain putting an end to civilized values and bringing the world under a single tyranny.

The United States government has elected to spend huge sums for a program of weapon development. The program cannot be carried out without a large staff of technical men. Today it appears certain that a staff will be available, come what may. Consulted only on questions of technical feasibility, scientists and engineers have not sought responsibility for the direction of their work. If better bombs and rockets are wanted, it seems that technicians will supply them.

Scientists are not evil men, although much that they produce is used for evil. In the past three years, many of the more sensitive among them have deliberately but quietly left weapon projects for work in schools or useful industry. Many, appalled at the impact on world affairs of their recent work, foresee with increasing fear their further involvement in the very heaviest decisions. A small fraction of scientists, as of all men, enjoy this increase in power. Others see that the future of science as an institution is being decided by forces outside their control and even outside their ken, and they do not like it.

Most technicians now in weapon projects would say they are there by chance, so to speak. They took jobs offering many inducements—the use of very expensive equipment, excellent living and working conditions, good salaries—and found themselves at work on ways of killing people. They deny responsibility for the Hiroshimas, past and future, as the Nazi slayers denied responsibility for their gas chambers.

Scientists who work on military problems can defend themselves with the claim that their work is interesting. It makes use of the same techniques as all scientific inquiry, it presents challenging problems to the mind, sometimes it produces a by-product that is good. The claim that military problems are interesting, however, is not apt to justify their prosecution in the minds of most people. The interest of a few physicists in phenomena of the outer atmosphere, or in lunar exploration, will not persuade many persons to support rocket development; those who support it, and those who oppose it, will do so because rockets can bring sudden death to millions. Surely E. Teller, who writes of "the great scientific problems connected with further development of the atomic bomb" (January, 1948, BULLETIN OF THE ATOMIC SCIENTISTS), does not suppose that the Army and the USAEC support this work because of its "great scientific" quality.

There are many interesting scientific problems. Few scientists would themselves select military problems. Nearly all scientists will agree, we believe, that given a change in the world situation many of their present activities should stop. No one "should" work on more efficient atomic bombs, more virulent strains of bacteria for biologic weapons, supersonic flight, and so on. The problem is to change the situation so that the quotation marks leave the word "should". Given a change, few scientists would want to work on these horrors. But not many seem ready to assume responsibility for deciding what quality and degree of change is required before they will stop working on military problems. By and large, scientists seem willing to let other men decide their course, in the future as well as the present.

It should be possible for scientists to dispel this impression. What is needed is a serious, searching discussion of the responsibility of scientists.

Imperatives and Rights Versus Judgment and Choice

Many scientists seem to dodge this question with easy rationalizations, which generally fall into one of two categories, curiously incompatible, yet often voiced together. The first is the argument: if the world were a different and better place, it would not be necessary to work on problems of killing, but things being what they are . . . et cetera. The second is the claim of the scientist's sacred right to work on any problem he chooses—this claim is often accompanied by acceptance of the sacred duty to pursue truth along a line of research which, as if by coincidence, contributes to a military problem.

Even if the world were to turn toward peace, even if the situation were so greatly changed that strong social disapproval of military technology was general, scientists would still face the question of responsibility; they would still be offered research and development jobs of military character promising great personal advantage. Even if military work were illegal, there would be men with money and power to support it; and the rewards to scientists would be vastly increased. Scientists would still face the choice of behaving like free men who weigh and choose their course of action, or like automatons who display unquestioning obedience to a benevolent master. They would still have at hand the excuse that work on military problems is necessary *just in case* scientists in other parts of the world also work on these problems, since no positive proof can be given that this is not so.

Many scientists now say and believe: while we ourselves would prefer not to work on new weapons, we must nevertheless do so, because if we don't others will, both here and in Russia. We suppose such considerations are tactically necessary at times, but it is not pardonable to confuse tactics with the thinking which should precede even strategy. Ethical questions cannot be decided by first considering what the meanest man in the world will do, and by then emulating or outsmarting or appeasing him. It is not valid to base ethical principles on the fundamental notion that everything is determined by everything else—such extreme sensitivity to the connexity of things leads to a model of society in which each individual points at several others and says, "Not me; I do it because of them." Each deplores "human nature", and by this term

means that part of man's nature which he shares with the pig.

It is to be feared that persons who use this reasoning do not value moral values enough. This fear is confirmed by the observation that this sort of (false) relativism is generally reinforced by the (false) dualism which puts religious ethics in one sphere and everyday professional ethics in another.

The claim that scientific study must be absolutely free is harder to understand. It should be a commonplace, by now, that absolute freedom, if it means complete freedom, is not an absolute good. *The claim to complete freedom is merely the claim to freedom from responsibility.* Freedom in science should always be restricted in consideration of its effects on people. In some cases this is obvious to nearly everyone; for example, painful or lethal experiments on human beings are generally not considered good form. No scientist should be free to do experiments whose outcome is likely to be used to harm people, even though he is motivated solely by the desire to find out the truth.

E. Rabinowitch, in the editorial of the October, 1947, BULLETIN OF THE ATOMIC SCIENTISTS, asserts: "As scientists, we believe that the urge to observe facts and search for the laws of nature, cannot be evil, since it is part of mankind's general striving for truth. We believe that the freedom of scientific investigation is fundamental. It should not be denied or abridged, any more than the freedoms of religion, opinion and expression." It is implied that the latter freedoms are unlimited. They are not. There are no valid absolutes in ethics, nor any absolute "good". Nor is the comparison entirely acceptable. The Army is not subsidizing research in theology or in politics. If modern religion were being used to prepare mass destruction, Rabinowitch, with us, would favor curtailing its freedom.

Frequently the claim that scientific investigation must be absolutely free is accompanied by the separation of pure science and technology. It is argued that the former is neutral and cannot be judged, since its results cannot be foreseen. This is undoubtedly true for *most* of pure science, and it is also true that engineers even more than research scientists enjoy the illusion that whatever they produce must be called Progress, that whatever they are paid to work on is inevitable, and that it is someone else's responsibility to decide what is good and what is bad. But in the case of *some* pure science, it is not quite true that one can never foresee how the results of a particular study will be used. It is often true that one cannot foresee what good will come of it. It is oftener true, for *some* pure science, that one can see what bad will come of it. Pure research in super-sonic hydrodynamics, whether mathematical or wind-tunnel, may be taken as typical. The workers in this field must surely know that the successful carrying through of their studies will lead to more effective ways of killing people. This fact far outweighs the equally certain fact that one can imagine pleasant constructive outcomes as well. Can anyone seriously claim, merely by saying the world truth in a special tone of voice, and by spelling it with a capital T, that the positive value of this work to civilization outweighs its threat in the immediate future?

The distinction should be between work that is for a bad purpose and all other work. Real freedom means the freedom to judge what is likely to be bad and what is likely not to be, and to make this judgment the basis for responsible choices, even when they are unpopular and when they do not coincide with the best opportunities for research, salary, or other personal advantage. No part of pure science or engineering (themselves only parts of a continuum) is absolutely free of this judgment and choice.

Big Institutions Versus Local Democracy

How can scientists and engineers exercise responsibility? It is much easier to answer this question for a world at peace than for a world at war, whether cold or hot. We will turn our attention first, then, to a better world than today's.

There is little danger in the efforts of an individual scientist who freely follows the suggestions of his imagination. The danger arises when groups of scientists are organized, either at universities or proving grounds, in a coordinated set of studies directed toward a specific end. As matters now stand, decisions affecting such projects remain in the hands of a very few men, who know what they are doing and accept the responsibility for it; while the majority, engaged in highly specialized tasks whose relation to the end of the project is not always evident, enjoy the illusion that their work is pure science, without moral implications—that under different circumstances they might well freely select the very same problems for independent study.

Scientists have a strong tradition of testing scientific ideas by free discussion. They should extend this tradition to discussions of the social consequences of organized group study; and if the consensus is that the consequences of a given study are apt to be evil ones, they should refuse to engage in it. Few scientists would wish to see the adoption of laws which list in detail a number of forbidden scientific activities. On the contrary, we must expect scientists themselves, with the help of others, to prepare a responsible list of research topics on which no civilized scientist should work. As often as a dangerous outlook arises, the scientists and laymen of the world should be told about it in full detail; a decision to go ahead with a technical development should come after democratic discussion among many men of a wide range of competences; and the decision, with all facts needed to judge its implications, should be widely publicized. Dangerous outlooks are all that need be judged; men of vision should not be held back by the failure of the majority to see the vision's promise, except when the vision is of death and destruction.

The discovery of nuclear fission, for example, opened a dangerous outlook. The work in nuclear physics which preceded it and the discovery itself were not dangerous; furthermore, many of the activities of the Manhattan Project were also not dangerous, e.g., the production of radioisotopes by low-level piles and the study of neutron radiation. A very heavy investment of talent and money lay between these activities and the mass production of atomic bombs; and it is the question of an investment of this type which should be openly discussed and decided by responsible men.

During the past century society has grown enormously more complex and the units making decisions of great consequence for society have grown fewer and larger—the state and its bureaus, the giant corporations, the

monolithic trade unions. In the face of these trends, it is imperative that local democracy be preserved and strengthened; by "local" we mean the small identifiable groups of men who regularly deal with one another —the local farm groups, religious groups, professional societies, trade groups, and so on. Each group has a responsible role to play in its own field. Particular courage and freedom of intellect will be demanded of the scientist, in view of the fact that only the largest institutions can grant him the scores of millions often required for special research apparatus which he desires. There are influential groups which would regiment science while bestowing upon scientists special status and comforts; indeed, in Russia this has already occurred.

At first instant, it appears presumptuous for scientists to prevent a technical development desired by another branch of society—a case of the tail wagging the dog. This notion will not stand scrutiny. Generally the group desiring the development represents society as a whole no more than scientists do. It is impossible for every issue to become an issue in national elections, or for a national electorate to be sufficiently well informed to judge all issues. Senators are not elected or rejected according to their stand on the government's policies toward the Navajo Indians, the conservation of shrimp—or the development of an atomic super-bomb! These are issues which require local democracy.

In a better world, we may expect the climate of opinion among scientists to make it difficult for any individual to work on an atomic superbomb. It is not necessary that a large majority of scientists engage in an ethical crusade. A relatively small group of men, by making up their minds to work on things which should not be worked on, can exert strong moral leadership. There will undoubtedly remain among scientists, as among all men, a few who are insensitive to moral consideration. It is fortunate, therefore, that weapon development is not like murder, a personal crime which the moral judgment of the vast majority of mankind cannot completely prevent. Weapon development has long been out of the amateur inventor stage. No single man or handful of men is apt to do real mischief. Only a large, heavily supported group of men, hard to collect if opposed by prevailing social opinion, can make dangerous improvements in modern weapons.

Slavery Versus Leadership

We have been speaking of a better world. We do not suppose that scientists, by singlehanded effort, can bring about a better world. Scientists are members of society; their present activities are a response to complex social pressures—a human reaction to a vile situation. But key groups of men can take a strong lead toward a change in the situation. A climate of opinion can be built up in a subgroup of society which may enable it to play a constructive role. The chances of a change may seem small; but even when change is latently possible, with fair likelihood, it can come only when a number of key groups take the lead in actively working for change. Scientists are a key group, but they do not act like a key group. The leadership of even a small band of scientists can have a tremendous effect.

If scientists are to take the lead toward peace, they must show themselves capable of acting *against* their own short-time personal interest. Scientists deplore the intensive work to produce more desperate weapons; they deplore the growing control of the Army and Navy over all types of research, through "free" grants to research institutions; but they continue the work.

The atomic scientists of America have been frantically asking for a peace in which they can act as free scientists, and not as vendors of death. They have importuned the world's statemen to change the situation, by controlling the atomic bomb and other weapons of intercontinental warfare. Scientists should now ask themselves, is not a change in their own behavior and attitudes a pre-condition to the political change for which they ask? They developed the bomb without guarantees of even discussion of the manner of its use; they now ask other men to build safeguards against its use. How much easier would be the building of peace if scientists make it clear now that they are willing to control themselves. As they have said so often, the atomic bomb *is* a revolutionary weapon, and science will not escape the revolution it will bring. For science the revolution may well bring slavery. If scientists insist upon business as usual (atomic super-bombs and all), whatever else may change—if the pattern of subservience to authority continues to spread among scientists—will not this fact contribute to the forces working to bring about a totalitarian world?

Scientists may be in a better position than statesmen to exert leadership toward peace. Over several milleniums, statesmen have a record of nothing but war. A major function of statesmen is the preparation for the eventuality of war; and they continue it in every nation-state, openly or in secret, inadvertently or deliberately, even when nearly all mankind wants peace. If a few statesmen work single-mindedly to abolish this function of statesmanship—or they refuse to share in this function —they are soon apt to find themselves statesmen no longer. Preparation for war is not a major function of scientists, just yet. They will appear selfish if they seem unwilling to modify the direction of their scientific studies—if they insist that the privilege of working on atomic super-bombs is sacred, even in a world at peace —while urging other men, the statesmen, radically to alter their ways.

The parallel of constructive politics for the nation is professional ethics for the scientists. Each should have a strong influence on the other —the latter may have an influence on policy greatly disproportionate to the scientists' numbers. A prerequisite of professional ethics is a serious discussion of the responsibility of scientists. Such a discussion itself is bound to encourage those who work for peace and to strengthen their cause.

We do not presume to predict the outcome of this discussion. Scientists may decide that all present work on weapons contributes to war, and should be stopped. They may decide that some work on weapons is tactically necessary in the present situation, and stand openly beside the military man in accepting responsibility for the outcome of this work. They may decide that some work should not be carried on even today, in spite

of the world-wide evil which presses upon them (the atomic super-bomb, perhaps?).

Can American scientists contribute to peace? Yes, if they are ready to question whether their present studies contribute to peace or to war; if they will accept responsibility for the use of their findings; if they will make it clear that they stand ready to restrain themselves from work liable to be used for killing people; if they will recognize that large groups of men working in secret are *always* a menace to mankind, whether a priesthood, a Communist Party, or a Manhattan Project. These are the conditions. If they are met, American scientists will find constructive answers to the question here posed.

Science Versus Civilization

American scientists are not asked to leave weapon projects to save their souls. They are asked to recognize the implications of the wholesale destruction now in preparation; to decide which of their present activities must stop if the world is to turn toward decency; and to take up the heavy role which they can play in creating conditions such that nearly all scientists will want to stop these activities.

The possibility of failure must be faced. The world may go down in flames. The world may be united without armed conflict in a single totalitarian state. Let each scientist try to imagine what he would do to preserve some bit of science through these awful times. What lines of work will it be possible and worthwhile to continue? Research on better atomic bomb tamping?

One measure of the collapse of civilization and the destruction of civilized values during the twentieth century is the extent to which scientists now work on killing. Science is not civilization. Its subject matter, goals, and methods are not in themselves evidence of man's advancement from barbarism to a civilized peace. Today scientists are being made accomplices in civilization's suicide. They must act to prevent this tragedy. They must develop together the responsibility which is required before action is possible.

Comments on "Freedom Demands Responsibility"

Electronic Don Quixotes?

by Eric Ashby

Dr. Ashby is Professor of Botany at the University of Manchester, England. His book, "Scientist in Russia", was reviewed in the February issue of the BULLETIN.

One's first reaction to the article "Freedom Demands Responsibility" is to congratulate the authors on their courage. Daniel and Squires have not been afraid to raise a problem for which they cannot suggest a solution, or even a working hypothesis for seeking a solution. No scientist cares to do this about his science, but in considering the prevention of war there is no alternative, except to neglect the problem altogether.

Accordingly comment on "Freedom Demands Responsibility" must be confined to criticism of the analysis of the problem of how to prevent war. To a biologist totally ignorant of atomic physics, and all but ignorant of American politics, Daniel and Squires' argument seems to contain several weaknesses.

The fundamental (but pardonable) weakness in "Freedom demands Responsibility" is an over-emphasis of the importance of scientists in war, and therefore in the prevention of war. It is true science and technology have changed the procedure of war: it is no longer an affair between professional armies, and it is now dangerous for civilians even on the winning side (but let us remember it was always dangerous for civilians on the losing side). It is true that nowadays a High Command without physicists and engineers stands a poor chance of victory (but let us remember that Archimedes was scientific adviser to the High Command at Syracuse). It is true that new weapons make the prospect of recovery from the next war very remote (but a score of civilizations have already vanished from the earth without the help of atomic energy). What justification is there for the modern scientist to look upon his contribution to war as original and epoch-making? In my opinion, there is no justification at all. If you measure the evil of war from the number of casualties, certainly scientists have increased its potential evil. If you measure the evil of war from the level of individual suffering, then you must admit that it hurts as much to be hit by an arrow as by a bomb, and Penelope suffered as much waiting for Ulysses as any Californian wife for her G.I. Atomic scientists should ask themselves s e r i o u s l y whether it is not a mixture of vanity and sentimentality which is driving them to take on themselves the burden of the problem of war. War was evil enough before atomic bombs, even before aeroplanes. And even if atomic bombs and aeroplanes were outlawed (an obviously fantastic speculation) war would still be evil, and it would still be a menace. Tolstoy's "War and Peace" ought to be obligatory reading for all atomic scientists.

A second and minor weakness in "Freedom Demands Responsibility" is this daydreaming, common among modern scientists (particularly the sort who belong to the Association of Scientific Workers), that the scientist could, or should, take over some of the responsibilities of politicians or statesmen. Any scientist who has become involved in government or diplomacy knows that scientists as such, are no more competent to take part in government than any other sort of worker; if anything, less competent, because a scientist keeps an open mind until the evidence is convincing, whereas a statesman is obliged to make decisions on inadequate evidence every day of his life.

A third weakness in Daniel and Squires' analysis is to suppose that there might be some special solidarity of conscience among scientists because they realize the awful potentialities of their work. Do they, any more than other citizens? I would hazard a guess that any citizen of Hiroshima knows more about the danger of atomic bombs than any atomic physicist. There is very little cause to hope that scientists, by reason of their experience, are likely to exhibit a higher standard of morality, or a greater influence on democratic government than any other group of workers.

If these three criticisms of "Freedom and Responsibility" are accepted, it follows that any analysis of the problem of how to prevent war is

false if it ascribes to scientists special influence and special responsibilities. The prevention of war is an urgent practical problem to be solved (if it can be solved at all) by political techniques, not by electronic Don Quixotes.

My personal analysis of the problem is as follows:

1. Human nature being what it is one must accept the fact that in all civilized countries, scientists will be available for weapon research. Therefore the procedure of war is likely to develop on the lines foreseen by Daniel and Squires; and even if this were not likely, the risk of war would not be lessened.

2. Democracy and Totalitarianism being what they are, one must accept the fact that without revolution, the almost unanimous fear of war on the part of ordinary citizens in all countries will not prevent Governments going to war.

3. The machinery of government being what it is, one must accept the fact that the maneuvering between States, on the outcome of which the issues of peace or war depend, will remain in the hands of politicians, who are alone in possession of the relevant facts and facilities for negotiating with foreign countries.

Two ideas arise from this pessimistic analysis. The first is that the only influence *inside* a country which will prevent the country going to war is a threat to the stability of its economy and its government. The second is that if the disinclination to go to war is unilateral (asymmetric, as Daniel and Squires put it) then the country which refuses to fight has to choose between a policy of non-violence and submission to the enemy (so successfully exploited by Gandhi) or the "dishonorable bargain bringing the world under a single tyranny".

What group can most effectively stop a country like the Soviet Union going to war? Certainly not its scientists. Many observers would say that the peasant has the key to the stability of Russia. If, even for one year, the collective farms failed to deliver their food to the cities, Russia would be crippled beyond the possibility of fighting. War without bombs is conceivable. War without bread is inconceivable. Therefore it is to the Russian peasant rather than to the Russian scientist, that I would look for the prevention of war. And, by all accounts, the peasant is more likely to prove co-operative. The United States must have a similar chink in its armour: the middle-west farmer perhaps, or the miner; groups of men with far more solidarity than scientists, and much more powerful politically. It is to these groups, not to American scientists, that I would look for a non-violence policy in the United States.

And suppose such groups, in Russia or America, did decide on a policy of non-violence, what then? If the decision were symmetrical, well and good. The problem of the prevention of war would be, at least temporarily, solved. But if it were asymmetrical, the country would be faced with a moral problem which lies far beyond the technique of scientists to solve. The country might decide to make the "dishonourable bargain" Daniel and Squires refer to, on the grounds that it is better to sacrifice a little liberty than to be dead. Or the country might submit, offer non-violence, thereby save millions of lives, and yet (like India) in the end score a moral victory. There are only these two alternatives for the asymmetric pacificist; and perhaps religion is the only discipline which would help him to make up his mind which alternative to choose.

There is a danger that these comments might be interpreted as a plea for the scientist to withdraw from consideration of the problem of war, and to leave it for more influential groups of workers (miners, farmers, and so on) to worry about. So let me dissociate myself completely from such an interpretation as that. My point is that so long as the scientist discusses the problem as though he had created it, and as though it was his peculiar business to solve it, so long will he be ignored by the trade unions and laughed at by the politicians. But if the scientist combines with the man who grows his bread and the man who digs his coal, in a common assault on the problem, he may have some chance of making an impression on governments, and influencing the course of diplomacy.

The Special Responsibility of Scientists

by A. D. Ritchie

Dr. Ritchie is Professor of Philosophy at The University, Edinburgh, Scotland.

Drs. Daniel and Squires are very rightly perturbed about the way research on nuclear fission is used for destruction, actual and potential, and have put their fingers accurately on the important points. As they say, there can be no freedom without responsibility. The investigator who works on his own, using his own resources, may with some plausibility claim freedom without responsibility. At any rate he has freedom, and responsibility is the concern of his own conscience. But now he is practically extinct. Most investigators are employees in large institutions. They can use the traditional soldier's excuse that they are only obeying orders, if they like to turn themselves into serfs; well paid, highly privileged serfs, of course, but still serfs. To be free, a man must take responsibility for the whole of his actions and the whole of their consequences, so far as foreseeable. If he acts under instructions he must claim to be fully informed by those who issue the instructions as to what is intended and why. He must also claim the right to consult his scientific colleagues and act in conjunction with them. The second claim is vital, because governments are more and more becoming the employers; and the individual is helpless against them, even in democratic countries. On the other hand, no government can afford to antagonize an organized group of technicians who have a monopoly of technical competence or anything near a monopoly.

So far I am merely emphasizing some of Drs. Daniel and Squires' points, and have nothing to add to them. The remarks that follow are intended to put the argument in a wider perspective, for there is a risk that too much attention will be paid to one symptom of a widespread disease; though it is admittedly a noteworthy and alarming symptom.

The present epoch of history is more dangerous than earlier ones because of the greater scale and speed of events, but because of that alone. On a smaller scale at a slower pace events have been going the same way most of the time. Our present situation is the natural outcome of the old; it is not different, only worse. At most times, in most places, technical improvements and inventions that could be used for destruction have been so used, first and most energetically; only secondly and less energetically for constructive and peaceful purposes. The first stone axe or arrowhead may have been made for killing game and not for killing the men across the river. If so it was

an exceptional axe or arrow-head. Even if so, it is fairly certain that the improved game-killing technique was used to exterminate all the immediately available game. The same considerations apply to the first bronze spearhead and the first steel knife. It is true that the Chinese invented gunpowder for making fireworks and scaring birds off fruit trees: Europeans quickly put it to other uses; so it is not much of an exception.

Taken as a whole the most enduring technical achievement of mankind is the devastation of the earth and the destruction of its natural resources; forests cut and burnt, fertile soil exhausted, waters polluted, fish and game exterminated, land despoiled and disfigured by mining. In the old days it seemed all right, you could always move on somewhere else; and seize better land belonging to somebody else; there was plenty of land. Of course there has been compensation; conservation and improvement of soil by good husbandry, draining and irrigation, domestication of animals and plants, and so on. In the last 200 years science has been applied to the exploitation of natural resources, on a large and increasing scale. There has been some increase in the compensatory process of conservation, but far more in devastation, and destruction. In the last 100 years more has been wasted than in the whole of the rest of human history. We are now faced, as Sir John Boyd Orr has emphasized, with an increasing world population and world food production, if not actually shrinking, certainly not keeping pace with population. Starvation and malnutrition do not operate as quickly as atomic bombs, but may be more effective in the long run.

The old excuse for technological destruction (as it may be called) was that technological processes were undirected and their results unforeseen. The industrial entrepreneur was just an individual who could not see beyond his immediate profit, if as far as that. Similarly, the scientist or technologist could not see beyond his immediate job. Perhaps it was so; but now things are rather different. Operations are on a large scale; they are done collectively, and more and more are controlled by governments or done by them directly. Things can be foreseen to some extent, which previously were unforeseeable.

Governments are not necessarily better or more provident than individuals, and may be worse. Governments have always assumed that the technician is no more than a willing tool. If he showed signs of flagging he could be stimulated by being told that the technician on the other side was making bigger and better weapons — or whatever it was. Governments have banked on the fact that the technician (including the scientist) likes his job and will accept any plausible pretext for getting on with it. If enterprise, technical initiative and research are called for to improve the art of torture, then torturers are likely to be forthcoming; not many, of course, but probably enough to fill the better paid posts.

Governments are primarly responsible; but governments are as good or bad as people let them be. So, we are all responsible in some degree. Those who are scientific and technical experts are specially responsible because they, if anybody, know what can and cannot be done, and what are likely to be the consequences of action or inaction (often the most disastrous. If they act collectively, they do not need to wait to be asked for advice; they can give it. Even the politicians will have to pretend to listen, and that is the first step towards listening. The collective wisdom of the scientists is no more infallible than anybody else's, but it could be used to avoid some blunders. If they are content to be used as mere tools, they can be fairly certain they will be misused.

An Economist Comments

by A. P. Lerner

Dr. Lerner is Professor of Economics at Roosevelt College. Articles by him have appeared in previous issues of the BULLETIN (Vol. 2, Nos. 5, 6; Vol. 3, Nos. 4, 5).

In Olaf Stapledon's "Last and First Men" the discoverers of atomic energy decide that the secret is too dangerous to be entrusted to the human race. They therefore destroy the formula and it is not rediscovered for hundreds of years. Some atomic scientists in America and in England seem to feel that they should do likewise. They recognize that the nature of modern science makes the burying of a secret possible only in a world controlled by the imagination of the novelist. Nevertheless, the guilt that they feel about their participation in the development of the atomic bomb, emphasized by vivid pictures of Hiroshima and by the spectre of the threatening atomic world war, makes them wonder whether, like Stapledon's heroes, who suffered torture rather than divulge the dread secret, they should not somehow arrange to avoid participation in the development of more powerful forces for a world seeking to destroy itself.

Daniel and Squires make the suggestion more concrete. They suggest that scientists should establish a professional code of honor that would keep them from lending their services to the development of instruments of destruction.

The basic argument for the proposal is that scientists, like other men, must recognize the responsibility for the effects of their actions and should agree to outlaw such activities as increase the danger or the destructiveness of war. An international stalemate having been established where both America and Russia are arming, each because the other is arming, somebody must do something to break the vicious circle. Russian scientists being powerless, the free scientists in the West have the responsibility, that goes with their freedom, for breaking the vicious circle by refusing to participate in military research.

There are many obvious errors in the argument. They are even mentioned, but only in a sort of absentminded manner which enables them to be lightly dismissed without any recognition of how fatal they are to the reasoning. The authors, for instance, say that they "are not among those who view the mere existence of weapons as the principal cause of war." But the argument goes on just as if they had said the opposite, with perhaps the modification that it is not the existing weapons, but the weapons that are yet to be discovered that are the main cause of war.

It is probable that Daniel and Squires, and the many scientists who feel uncomfortable about working on "weapons" research, realize that unilateral disarmament by the West could increase rather than diminish the danger of war. They may be able to see that one of the reasons why the present war is cold rather than hot is that the East is not yet strong enough to take on the West. They may have observed that at the end of the war, when the West had enough military power (and the atom bomb) to have done whatever it wanted with the East, there was no talk of the danger of war. But they have not applied to the proposal the scientific principle of judging an action by its effects. They have resorted instead to an "ethical" rule against the development of instruments of destruction

without considering the effects in the present situation of Western scientists going on strike. The possibility of Western strength keeping the peace while a world government is being established is thrown out of court by confusing it with the stupid notion that permanent peace can be obtained by trying to maintain American military superiority.

If we try to judge the proposal by its effects it is difficult to consider it seriously. Its primary effect, insofar as it was successfully applied, would be to weaken the West relatively to the East. Western scientists could double this effect if they would not merely refrain from developing military power for the West but went to work for the development of more powerful weapons for the East!

Daniel and Squires will be shocked at this suggestion. Their sentimental approach may prevent them from seeing that it is a direct extension of their shortsighted humanitarianism, which accepts responsibility only where there is a simple or a dramatic connection between their action and the effect, but disregards it where the connection is less dramatic or less obvious.

The untenable distinction is between direct and indirect responsibility for what is done by society. The attaching of a special guilt to the scientist for the war in which his work is used is like putting more blame for a murder on the man who made the knife than on the man who hires the murderer. The scientist who seeks to escape responsibility by giving up work which seems likely to increase man's destructive powers is like the conscientious objector who seeks to escape participating in the war by doing some other essential work which releases another man to do the fighting. The escape from responsibility is spurious.

The real responsibility of the scientist, as of everyone else, is to participate in political action for the organization of a world government to prevent war. It is no fulfillment of this responsibility to try, or even to succeed, in "civilizing" war by limiting it to the old weapons (which now include "ordinary" atom bombs). And there is no greater responsibility involved in participating in "weapons" research than in any other activity that forms a part of our intimately integrated economic system.

The atomic scientist worked out some algebraic equations or made a number of experiments, on, say, the diffusion of gases at low temperatures, and knew that the results of his work were used to make the bomb dropped on Hiroshima. But how is he more entitled to claim guilt than the inventor of the internal combustion engine without which the airplane could not fly, or of the high octane gas without which the plane could not carry its load so far, or of DDT without which the base on which the plane refueled could not have been held, or of the barometer without which flying would be impossible?

And why pay particular attention to inventors? What about the man who made the concrete or steel runway from which the plane took off, or the men who mined the coal which produced the steel, or the men who made the gasoline, or the men who built the power plant that created the current that made the aluminum in the airplane? And what about the professors who taught algebra and physics and engineering to the men who worked at the atomic project? Is there anyone who is not responsible for participating in the making of the atom bomb?

In a modern society everyone participates in all social action. No men are islands and cooperation is indivisible. The atomic scientist has no special credit or special responsibility. He merely has a little more glamor. His responsibility is the same as that of every other citizen. It is to prevent war, not to be concerned with the manner and efficiency with which modern methods are used in war. It is only the atomic scientist's natural tendency to exaggerate his own importance that makes him claim the bomb as his baby, ignoring all the other people who were just as necessary for its final delivery. He is merely an obstetrician who thinks he is also the father and mother.

The universalizing of responsibility can easily become another way of dodging it. Daniel and Squires properly decry the evasion of responsibility by everybody pointing accusations at everybody else. They say that "Ethical questions cannot be decided by first considering what the meanest man in the world will do, and by then emulating or outsmarting or appeasing him." And so they pour scorn on the argument: "If the world were a different and a better place, it would not be necessary to work on problems of killing, but things being what they are . . . et cetera,"

But unhappily things really are the way they are. The behavior of mean men must be considered among the other data of the universe. The normal scientific procedure of trying to do that which will have the desired effect cannot be suspended by declaring a question to be ethical rather than practical. Suppose a successful strike by "ethical" scientists made the Russians believe that the American population was friendly to communism (they would surely not be undeceived by their communist agents who would claim credit for the strike as a fruit of their infiltration) and this encouraged them to start a war against the United States. Is it permissible for scientists to disregard such possibilities because it involves the recognition of action by "mean" men or perhaps merely by misguided fanatics? Could the "ethical" intent of the strike absolve them from responsibility for the war they would have brought about?

Such a development would indeed saddle the scientists with a special responsibility. But the responsibility would be theirs not because they were scientists whose work was connected with "weapons" research, but because they would have taken upon themselves a decision as to national action and policy. The same responsibility would lie on the coal miners if a political coal strike by them induced the war. It is the *political* action or the exercise of *power* which has distinctive effects and therefore also a special responsibility.

It is, therefore, perhaps not so surprising that the claim for special guilt or special responsibility develops into a claim for special power. Daniel and Squires consider whether the community of scientists, if it took on itself the onus of excommunicating research on destructive weapons would not be usurping the authority of government in decisions that affected the population at large. They conclude that this would not be a case of "the tail wagging the dog." With apparent seriousness they declare that the development of an atomic super-bomb, together with "the conservation of shrimp . . . are issues which require local democracy."

There are many other surprising statements, though none quite as surprising as this one. There is the suggestion that statesmen cannot govern well because if they try

to they are not likely to be re-elected. Scientists would presumably govern well because they do not have to bother about such troubles as popular mandates—and this on the same page where we are warned about totalitarian dangers of the government being able to hire scientists to work on projects of the government's choosing! There is the pronouncement that American armament *diminishes* our security by causing the Russians to arm too until everybody has the most efficacious number of atom bombs—as if it were known that the Russians would not arm if we did not. But there is one fallacy that is much more dangerous than all the others together.

This is the fallacy of supposing that scientists know enough of the ultimate results of any research project, to be able to say whether the knowledge that it will yield will be used for good or for evil—that they can wisely decide whether to permit the project to continue or to pronounce a taboo that, by keeping enough scientists away from the project, would defeat it.

There is a common belief that the expulsion of Adam and Eve from the Garden of Eden for tasting the fruit of the tree of knowledge, indicates a biblical objection to scientific research. But the Bible says that what the serpent offered Eve was the fruit of the tree of knowledge *of Good and Evil.* Adam and Eve got no new knowledge of the kind that one gets from scientific research. What they learned was that they were *naked,*—that their freedom from clothes was *Bad.* What they lost was not ignorance, (which is what knowledge tends to dispel) but innocence, which is lost by the imbibing of an unscientific certainty about good and evil that is fatal for any paradise.

What distinguishes democracy and science on the one hand from totalitarianism and dogma on the other is just this: the recognition of ignorance and uncertainty by the practitioners of the former and the assumption of certainty by advocates of the latter. The greatest danger to democracy and science, formerly from fascist and now from communist totalitarianism, arise from the totalitarians "playing god", just as is feared in the Bible story, ready to visit the vastest sufferings on men because of their certainty that it will be balanced by good in the end.

Sometimes the issue is discussed in terms of whether the end justifies the means. This is a meaningless question because, as Bernard Shaw has said, "What else can justify any means?" What is meant is: Can a good end justify a bad means if the end is uncertain and the means is certain?

The answer is inevitably that we must judge by our estimates of the probabilities. Most of us think that the war to prevent the establishment of Nazism over the world was justified because we knew enough and were certain enough about the horrors of fascism to be able to compare them reasonably with the horrors of the war to stop fascism.

When we speak of the immorality of the Communists in saying that the end justifies the means, we may merely be disagreeing about the desirability of their ends. But much more to the point is the certainty of the evil of the means, such as keeping millions of people in forced labor camps, and starving millions of people in a collectivization drive, while the good society, for the sake of which the sacrifices were imposed on the victims, seems further off and more problematical than ever. The basic sin is in the assumption of complete certainty that the project is *good* so that the men in authority can "play god". They can cause endless suffering without any twinges of conscience because they have eaten of the tree of knowledge of good and evil and *know* that what they are doing is necessary for the ultimate good of humanity.

The assumption of certainty is somewhat more understandable in those who claim to get it by revelation. They can in all seriousness and sincerity say "we humbly claim infallability." It is more difficult to understand it in those who obtain the "correct line" by a majority vote after a violent discussion (even if the majority is not rigged up behind the scenes by doubtful deals between the manipulators of caucuses). But however the Truth or the Correct Line is obtained, it is the certainty in its Correctness from which the totalitarian evils all spring. If it is certain that the line of policy is one that will establish the Kingdom of God or the Good Society of Peace and Plenty and Justice and Happiness for All, no amount of pain in the process of reaching Heaven can render the project uneconomic, and those who have the power cannot evade any of the means, however terrible, without incurring the still graver responsibility for postponing or preventing the millenium. The only error lies in the assumption of certainty. The rest of the path is an inexorable escalator of good intentions.

The scientist who declares that "weapon" research is bad and that scientists have the duty of boycotting it (i.e. sabotaging it) is taking on himself the responsibility of knowing that the effects of the research are going to be *bad.* This he cannot know.

In the first place the immediate effects of the discoveries that will come out of the research are never clear. Probably the most important application up till now of the research that went into the atom bomb has been in the use of radioactive isotopes for rapid research in biology and chemistry. While wind-tunnel research or rocket research may be used for the delivering of atomic bombs, it may also be used to prevent the delivery of atomic bombs or for the rapid dispatch of pennicillin.

But even where it is clear enough that the results will mainly be in increasing the destructive power of man's weapons, there can be no certainty that the availability of the knowledge yielded by the research will be harmful to man. It seems very likely, even though the generals themselves have said it, that the dropping of the atom bombs over Japan, even if they might have been handled much better than they were handled, saved hundreds of thousands or perhaps even millions of lives that would have been lost if the Japanese in their main islands had continued a despairing fight to the death as they did on the small islands.

There is still a possibility of the establishment of a world government to prevent war, and not the least of the forces that are pushing men to this achievement is the knowledge of the destructive power of the first atom bomb. The offer by the United States to give its most powerful weapon to what is in effect the nucleus of a world government is a great step forward in this direction. It would have been unthinkable before the atom bomb and before the effective intervention of atomic scientists, not by taking on themselves any governmental responsibilities about the

conduct of scientific research, but by their energetic and devoted activity in the normal channels of political action in a democracy.

This does not mean that scientists are not entitled to revolt if they are asked, even by a freely elected government, to devise, say, the best means of killing off all the negroes in the country. To revolt is their right and their duty, not as scientists but as citizens, and exactly the same duty would devolve on everyone else involved. Nor should their revolt be limited to refraining from participating in the crime.

But weapon research, and even the manufacture of atom bombs, does not seem to me to fall into the same category. Perhaps this is because I do not consider war as the greatest of all possible evils. I would consider the conquest of the world by totalitarianism, Russian or Nazi, as even worse than war. I am comforted by the belief that U.S. military superiority over Russia is a factor for peace. It seems to me, however, to follow that a walkout by American scientists would increase both the danger of war and the danger of losing out to Russian totalitarianism.

Of course, if some disarmament by the U.S. could be arranged as a first step toward world government and permanent peace, that would be another matter. Such a first step might possibly be a unilateral act of disarmament by the Government of the United States, but it could never be a unilateral action of sabotage by scientists blacklisting weapon research in the U.S. If scientists should think that disarmament could lead to peace, they, like other citizens, can further this policy, only by working within our democratic constitution even while continuing their researches.

It is the recognition of our inability to play God, our ignorance of the effects of adding to the sum of human knowledge and therefore of human power, that is behind the scientific attitude about the "sacredness" of scientific research and of the scientists' obligation to make available the results of his researches. But this is only a part of the scientist's credo. There is also behind it, as there is behind the whole *Weltanschaung* of democracy, the belief that man should be given a chance to work out his destiny. That man in the mass must be trusted with knowledge and power and political decision, and so he must be given the results of scientific discovery to increase his power for good and for evil, in the hope that the development of human civilization which has enabled many millions of people to get together for peaceful living will also be able to get the two billions together in the same way.

This is no certainty. It is only a hope. But the only alternative is to give up the hope. The only alternative is to take the responsibility away from man in the mass and usurp the responsibility for a chosen group for an elite with special interests and special foibles which might hope to escape even if the flood should engulf the mass of humanity. The only alternative is to give up democracy and to establish authoritarian government. But this would even aggravate the original sickness for which it was intended to be a drastic cure. For there would be more than one authoritarian government.

If democratic society is not to be trusted with the possible new weapons that science may discover, it is certainly not fitted to be allowed to handle the existing weapons. And what power or knowledge is there which cannot be turned into weapons? Everything that increases the understanding of the universe is dangerous. All knowledge is power and therefore all knowledge is dangerous. Literacy is a sword and free speech is a fire. Baby mustn't touch.

Science and Democracy are based on the hope that men can learn to live together. If, as is possible, men will not learn to live in peace and cannot be trusted with power, there is no solution in giving the power to any elites, for these too are men and not angels. All that those who want peace can do is to try to guide their fellow men by participation in political action for the world government that is necessary for peace. Scientists can continue the great role they have played in recent years in helping men to grow up. They will not succeed by abandoning the hope that men will grow up, and attempting to put the "super-bomb" matchbox out of reach.

Communications From French Scientists

As further contributions to the problems raised in the article by Messrs. Daniel and Squires, we reprint below in somewhat condensed form, two documents which have been sent to us from France.

The first is a statement on atomic energy adopted unanimously by the General Meeting of the French Association of Scientific Workers on July 17, 1948. As in the case of the British Association of Scientific Workers, the French organization is a trade union with considerable membership among academic and industrial scientists. Its leadership is strongly leftist. (The Chairman, Professor F. Joliot-Curie, the best known French atomic scientist, is a member of the Communist party); but the fact that the resolution was adopted unanimously suggests that the ideas expressed in it appeal to at least a large group of French scientists. These ideas agree with those presented by Daniel and Squires—that scientists should refuse to participate in further perfection of weapons of mass destruction. The crucial question of how to induce the Soviet scientists to join in the refusal to participate in secret weapon research, is not mentioned in the statement.

We reprint the statement not only because it is important for our American readers to be made aware of sentiments shared by a large group of French intellectuals; but also in the hope that this publication will induce other European scientists to present their opinions on these questions.

The second document is a letter sent to the BULLETIN by four French scientists, among them the distinguished mathematician, PROFESSOR JACQUES HADAMARD, Membre de l'Institut at Sorbonne. Other signers are ANTOINE LACASSAGNE, Professor au College de France, CHARLES MAUGUIN, Professeur a la Sorbonne, Membre de l'Institut, and JEAN ORCEL, Professeur au Museum.

The views presented in the letter are in agreement with those in the Association's statement, but are more sharply expressed.

FRENCH A.Sc.W. STATEMENT

". . . . Today, unfortunately, a very large part of the efforts and scientific means of the world is devoted to the research of weapons of mass destruction.

"As men, we cannot but condemn the use of force in the settlement of international questions; as scientists, the study, manufacturing or use of scientific armaments—atomic, biolog-

ical or others—seem to us particularly abhorrent.

". . . . Atomic arms are not the only means of mass destruction. Other means, less spoken of, notably biological arms, represent a danger that may be even more serious for humanity. In fact today bacteriological warfare can be prepared very cheaply and without detectable production centers by more than 20 nations; nor is it certain that a decision to end hostilities would stop its effects, or that the latter could be localized to the belligerents. This leads us to condemn military research which aims to increase the virulence of germs, or to obtain new pathogenic species.

"We believe that keeping therapeutic results secret, for military purposes, is already a crime against humanity."

"Atomic weapons can kill millions of civilians in big cities but it would have little efficiency against ground or air forces. It does not guarantee the occupation of the devastated ground. On the other hand, the more a war is waged with technical means (communications, convoys, pipelines, etc.), the more the army is vulnerable to partisan action.

"Due to the experience of other wars, we feel that an armed conflict would not be a blitzkreig and could not be localized. We fear that France and the neighboring countries would be utterly destroyed, since they would be used as a sort of atomic 'cushion'.

"Amongst the armaments of mass destruction, the U.N. devoted its attention only to the problem of atomic energy, whereas a separate Commission undertook the general problem of disarmament. The Atomic Energy Commission, whose duty it was to elaborate a plan of control, was not able to reach an agreement and sent the question back to the Security Council.

"It seems, however, that some sort of progress could have been made and we fully approve the British Association of Scientific Workers when it upholds the following ideas:

"1. the control of atomic energy cannot be separated from the other big political problems—only a feeling of trust could lead to the establishment of a form of control acceptable to all.

"2. complete security for all nations is impossible. "A plan which would give the appearance of complete security for one nation could be far from perfect for another nation".

"3. it seems likely that a form of control in which not all the states would participate would seem like a military alliance directed against the rest of the world. It would do away with none of the factors which create mutual suspicion but on the contrary would intensify them."

"Many who were disappointed by the failure of the U.N. negotiations seem to believe that only the creation of a World Government would solve these difficulties. But . . . the search for a utopic solution turns the attention away from certain possibilities which can be put into effect at once.

". . . . On June 25th, 1946, France pledged herself to limit to peaceful applications the development which she is carrying on in the matter of atomic energy, thus excluding all military applications. It would seem desirable that other nations pledge themselves to the same course. Already, *any nation can solemnly pledge not to be the first to use weapons of mass destruction against civilians* without injuring by that its own defense against possible aggression. Unquestionably, a great moral benefit would be gained by the nations which would make such a declaration.

"We believe that the problem of disarmament could be approached in the following way: as a first step, nations would cease the research and manufacture of weapons of mass destruction. Thus a second step would be made possible; the partial destruction of existing stocks, followed by the gradual establishment of a form of control. In this way we would finally come to the shaping up of the psychological and material conditions necessary for the total elimination of these weapons, to be accompanied by a complete form of control.

"If we can consider that secrecy, in the purely technical field is justified up to a certain point, it seems impossible to justify it in the field of pure science. In this case, secrecy appears to be delusive and dangerous, on the human level, as well as on the scientific and social ones.

" . . . . It is dangerous:

"a. *on the human level*—had the research of Pasteur and of his followers been secret, we could well imagine that the consequences of such a decision would have been deplorable. Humanity would have been rightfully indignant if French children alone had been the beneficiaries of these discoveries, which belong of course to the common inheritance of humanity.

"b. *on the scientific level*—from a nationalist point of view, secrecy slows up scientific progress in the country in which it is very strictly applied.

". . . . In a more general way, the scientific backwardness of a country slows down the progress of world research, and the lack of free international scientific exchange leads also to a feeling of distrust and anxiety which poisons international relations and gives birth to a tenseness that is dangerous for peace.

"c. *on the social level*—the strict safekeeping of secrets, considered military, leads to the gradual suppression of elementary civic liberties and to hypertrophic development of an expensive special police force.

"On the contrary, free publication of scientific results and their wide diffusion would facilitate not only scientific progress but also mutual understanding.

"It is desirable that the obstacles to free circulation of men of science be abolished as soon as possible, and that the difficulties of exchange as well as government restrictions be lifted in order to make possible visits to foreign universities and the purchase of publications and scientific material.

"In view of the seriousness and urgency of these problems, the French Association of Scientific Workers invites the scientists of all countries to multiply their efforts in order:

"a. to obtain from their governments a pledge that they will not be the first to use weapons of mass destruction against civilians.

"b. to abolish restrictions and secrecy in the field of pure science.

"c. to obtain from scientists a collective refusal to participate in biological and therapeutic research the result of which would not be normally published.

"d. to urge the resumption of international negotiations, by any means or in any place whatsoever, in order that the threats which weigh on the world be finally cast away, and that science may not be put to the service of death."

FOUR FRENCH SCIENTISTS SPEAK

"The world is in a state of tension created by a war psychosis for which no grounds exist except desperate propaganda, the roots of which spring from the difference in social and economic structures between capitalist and socialist states. . . .

"One of the fields in which the battle has become very bitter is that of atomic energy. It is easy to see why this is so. It is because no equilibrium has been reached on this point, whereas military forces in other fields can be considered as more or less in a state of equilibrium. In effect only one nation "possesses" atomic energy facilities and weapons. One can readily comprehend how the possession of a weapon so powerful compared to "conventional" weapons, could render its possessor drunk with success.

"At the termination of hostilities two courses of action were open to this nation: either to depend on its atomic weapons as a means of imposing its will upon the entire world; or to place them at the disposal of the United Nations without any mental reservations. It was the latter of these positions which seemed to follow from the declaration of Messrs. Truman, Attlee and King, a position to which we would like to render our public acknowledgment, the more so since the temptation must have been quite strong.

"We have no doubts whatsoever that the latter position is the one which appeals to the desires of the vast majority of the American people, and to scientists in particular. A great moral advantage would have accrued to the U.S.A. as a result of such a stand. Unfortunately, as a result of pressure exerted by internal forces who do not appear to be entirely unselfish, the United States has, in part, reverted to the former position; for it seems that the temptation for power is something that cannot be readily arrested at one stroke. After having offered this gift to the ideals of the Charter, the Americans seemed to assume that they could attach conditions to their generosity; not realizing that, in so doing, they were destroying the possibility of agreement both in this field as well as in others. While in a state of military preparation that is unique, they are suspicious of everyone, not realizing at the same time that others might be suspicious of them. . . . They have continued to manufacture atomic bombs while negotiations were in progress, thus encouraging other nations to search feverishly for the secret, creating thus an atmosphere of suspicion which appears to be mushrooming and out of which nothing constructive can be expected. The United States has thus lost a magnificent opportunity to give form to the spirit of the Atlantic Charter: the entire world would have applauded such a gesture in the interests of peace; and it would be showing poor understanding, indeed, of the American people to doubt for even an instant that they would have enthusiastically greeted the announcement of the cessation of the manufacture of atomic bombs."

". . . . The U.S.S.R. . . . calls for the prohibition of atomic weapons (without, as yet, offering further details as to the conditions of ultimate control to which it is willing to bind itself); even such prohibition would leave the United States in an advantageously strong position, inasmuch as their technical achievements have been in a continuous state of development for the past few years. The United States, on the other hand, demands immediate control of atomic activities, while reserving to itself the right to keep its bombs until she can assure herself that other nations are no longer seeking the means to manufacture atomic bombs (the technique of which, in any event, nothing can make her forget.) In turn, she offers very little in the way of details as to the moment at which she will decide that these conditions have been attained.

"It is quite simple to see that these latter conditions could be accepted only by those who rely completely on the generosity of the U.S.A. It is as much out of the question to ask this of the USSR as it is to request the USA to rely on the generosity of any other power.

". . . . One of the difficulties encountered during the negotiations at Lake Success has been the frequent occurrence of situations where the voting represented inaccurate pictures of the positions adopted. Instead of searching objectively for a solution to the problem, instead of acting as politically independent, many nations—as the British Association of Scientific Workers has aptly pointed out—have contented themselves with saying 'Me, too' to the USA or USSR.

"To get out of this impasse it is essential to make use of world public opinion, which does not want a war; and to appeal to those whose business it is to reason and reflect calmly and objectively, in other words to the scientists. Many people criticize them for having created the atomic bomb, but this reproach is hardly justified since, during the period in question, it was a matter of getting ahead of the Nazis. Furthermore, no one asked them for, nor followed, their advice before using it. But a number of them do continue this work of death while, because of their education, they can hardly hide behind the cloak of ignorance; in the event of the outbreak of a conflict they will bear a heavy responsibility.

"We French scientists work in a country whose technical and industrial resources, as a result of two world wars, do not play too important a role in the balance of world resources. But it is a country which has made considerable contributions to the whole of modern science, without attempting to draw from them exclusive advantages; we are particularly proud of the work of such people as Pasteur. It is, perhaps, because of this reason that we feel so intensely the satisfaction offered by research which is basic and beneficial; and it seems to us absolutely inadmissible that science could contribute, directly or indirectly, to the destruction of cities like New York, Moscow, Amsterdam or even Berlin or Hiroshima. The products of science should not be used for the purpose of establishing, by means of force, "free enterprise" at Moscow or "communism" at Washington. As citizens, we may individually have a preference for one or the other; but as scientists we believe that the choice should be made by scientific means, in other words by an objective study of the two types of society; and, on the other hand, by a free and clear expression of opinion by the peoples of each country. . . .

"But since it has become clear that such pressures cannot be exerted without resort to science and scientists, the duty of the latter is to declare solemnly and firmly that they will not lend themselves to such aims. They ought to do so before it is too late, before the fruits of their work may be exploited for ends which have nothing in common either with science or with the well-being of society—and the time for this is *now*. The rapid and prodigious development of science is such that every discovery, every technical achievement, however sensational it may be, quickly loses its superiority as a result of the possibilities of new discoveries, frequently unexpected.

"It is towards peaceful and scientific aims that the vast majority of scientists would like to contribute, independently of their nationality and of their political leanings. If they would only make their voice heard . . . If they would only take the lead . . . This is the only way out for them so that no one can say they have caused more sadness and horror than men like Pasteur, Lister or Koch have caused good. It is not sufficient to say: 'I didn't wish that.' . . ."

THE DISPERSAL OF CITIES --A FEASIBLE PROGRAM

Tracy B. Augur

In the May issue of the Bulletin, Mr. Augur, an outstanding city planner, discussed the defense aspects of city dispersal. He proposed that city building, already projected, be added in the form of small "clusters," separated by large bands of open country, and so reduce their vulnerability to atomic attack. This article explores the advantages and feasibility of a more fundamental regrouping of cities. Mr. Augur is a member and past president of The American Institute of Planners and one of a panel of consultants on the preparation of a master plan for Oak Ridge.

In an article in the May issue of the Bulletin entitled "The Dispersal of Cities as a Defense Measure", it was pointed out that a careful channeling of the nation's urban growth and redevelopment into a well-planned, dispersed network of small cities would be advantageous on four counts. It would greatly reduce the nation's vulnerability to attack, particularly attack with atomic weapons. It would greatly increase its capacity for production, both in peace and in war, by giving it a modern urban plant not subject to easy disruption in place of an obsolete one that can too easily be put out of action. It would minimize the danger of fifth column activity based on internal unrest by substituting wholesome living conditions for the slum and near-slum environments in which so many millions of Americans are now forced to live. And in accomplishing these purposes it would go far toward removing the threat of war by removing the weaknesses in our productive plant and in our social and economic order on which an enemy would rely for our defeat.

But to many people a fundamental regrouping of the nation's urban activities and population within a reasonable time appears a task of such fantastic magnitude and of such revolutionary scope as to be unworthy of serious consideration. It is the purpose of this article to show that, on the contrary, such a program falls well within the bounds of the country's capacity for construction and well within the framework of democratic principles and practices to which it is committed; that the building of cities on a colossal scale has been a normal activity of the American people since the earliest days of the republic and will continue to be for many generations to come and that its redirection into sounder channels can be accomplished through procedures that are well established and accepted.

If anyone doubts this nation's ability to build cities, he need only look at the record. At the time of the first census in 1790 what was then the territory of the United States boasted a total of only 24 urban places with a population of 2,500 or more. The 1940 census listed 3,464 such places, an increase of 3,440 in 150 years, or 23 a year, one every 16 days. In the latter third of that period, from 1890-1940 Americans built a new city on the average of one every 8½ days, and they kept right on increasing the size of the old ones at the same time. Because the country's urban population has always grown at a much faster rate than its total population, the rate of city building has necessarily been much higher than the rate of building of its total physical plant. To put it very simply, the American people have always built cities as fast as they have needed them in the development of their growing nation, and that has been no small order.

CITIES ARE STILL BEING BUILT

The American people are still building cities and building them in quantity. Since the war the annual rate of building urban dwellings has slowly edged up toward the million mark and construction of other urban buildings, utilities and streets is on a comparable scale. Because of the lag during the war and depression years, the rate of building is not yet great enough to meet the country's needs, but it can be increased whenever the people decide that is what they want. As noted in the previous article, we are approaching a rate of construction equivalent to the building of a city of four million people, or a hundred cities of forty thousand people, every year. We will come close to that goal in 1948 and can easily surpass it whenever we really want to. In terms of quantity, the record is clear that the American people have always built cities on a colossal scale, are now building cities on a colossal scale and can increase the rate without straining their economy or the construction industry.

The real problem is not one of quantity but of quality. Many of the cities that were built in the first century and a half of the country's history are now largely unfit for the life and work of today's urban population in peacetime, to say nothing of their extreme vulnerability in time of war. That is seldom the fault of those who originally planned and built them. Most of the horse-drawn carriages and wagons that were designed in the same period fail to meet today's transportation requirements but they were very fine and useful vehicles in their time. The deficiencies of today's cities are not the fault of their original planners and builders but of the succeeding generations who have persisted in using them long after the changing times demanded a change in their fundamental structure. Even more their deficiencies are the fault of those who repeated and are still repeating obsolete forms of city structure in later city building. Some of the early manufacturers of automobiles placed whip holders on the dash boards through force of habit, but they didn't repeat the mistake in later models. Contemporary city builders have not been as quick to see the absurdity of their adherence to tradition.

Actually a contemporary program of city building adequate to our times

requires no more of the American people than a show of vigor and ingenuity equal to that shown by their forefathers. Is that too much to ask? The task is bigger now in absolute terms for the simple reason that we have become a more populous and more highly urbanized nation, but it is no bigger in relation to our expanded resources of wealth and manpower. If we of the twentieth century cannot match the record of the American city builders of the eighteenth and nineteenth centuries, it must be because our ingenuity is not as great as theirs.

THE QUALITY OF CITIES CAN BE CHANGED

There is a great deal of contemporary evidence that great changes are taking place in the structure and distribution of American cities. They are important changes, but slow. Furthermore, on the whole they are not very constructive. Their greatest significance is that they demonstrate a high degree of discrimination between change that is change for the better and change that is merely for more of the same. Metaphorically speaking, the American people, in their attitude toward cities, have reached the point of accepting more comfortable and commodious buggies, but they are not quite ready to accept the horseless carriage.

The most basic change taking place today is one that is sometimes called deconcentration. The overall density of population in urban areas is declining. To put it another way, the built-up area of cities is growing at a much faster rate than the population. For example, in the period 1925-40 the New York Metropolitan Region increased 26 per cent in population while the built up area increased 56 per cent. The same pheonomenon is evident in nearly all cities and metropolitan areas. In fact, many cities which have shown little or no growth in population have continued to grow substantially in area.

There is both a good and a bad side to that picture. Any general lessening of congestion in urban residential areas is a good thing. The moving of families from in-town blighted areas to suburbs that are at least temporarily wholesome is a good thing. The bad part of the picture is that in the majority of cases the benefits are temporary and often matched with offsetting liabilities. The move to the suburbs often turns out to be a move from an area that has become blighted to an area that will become blighted, for the simple reason that the causes of blight inherent in the old city structure are transplanted to a suburban structure patterned after it. Over a period of years, the net result of the change is apt to be a general decline in the effectiveness and an increase in the cost of urban services due to the wider scattering of the people served, with no increase in the efficiency or the amenities of urban life.

The nature of this process is not always obvious. The spread of metropolitan areas often starts with the formation of new settlements or the growth of existing villages beyond the periphery of the central city, and gives the appearance of true decentralization. But the ubiquity of the automobile soon leads to the filling in of the intervening spaces, and those who build their dream homes in the country soon find that the country has receded and left them firmly grounded in the city again. They are farther from the center but they are no nearer the periphery.

THE EDUCATIONAL VALUE OF BLIGHT

One of the more encouraging changes of recent years is the widespread recognition that obsolescence of city structure is a reality and not merely a theorist's invention. The phrases "urban blight" and "blighted area" have entered the popular vocabulary and cities that formerly closed their eyes to such conditions now admit their existence. Blight is a sign of rebellion by the using public against city areas that are too old and obsolete to be used effectively and the fact that blight is spreading through American cities at a rapid rate is encouraging evidence that the rebellion is spreading too. There is nothing that spurs the development of new things quite so much as the refusal of the public to use the old ones.

Unfortunately, the American public is not so alert to the causes of urban blight as it is to the results. Many an honest dollar and many an earnest hope still goes into the building of new suburbs that carry the infection of blight because of their slavish copying of old city patterns. But even here there is some awakening. Home owners and investment bankers who have put their all into suburban developments to escape in-town blight are learning to their sorrow that blight can travel faster than the amortization rate of a mortgage. That is a disturbing discovery but its educational value is tremendous.

THE BUILDING OF NEW TOWNS

A more encouraging turn in American thinking, though one less widely grounded in the consciousness of the general public and of those who deal in the financing and building of city structure, is the beginning of the building of new towns designed for modern living and protected against absorption in the sprawling growth of older cities. Trailblazer in this country was the town of Radburn, started in the mid-twenties in a rural section of New Jersey within commuting distance of Manhattan. It was a product of private enterprise, albeit private enterprise with an unusual degree of enlightenment and devotion to the public good, and it fell victim to the excesses of less enlightened private enterprise in the crash of 1929.

Before its initial period of development ended, however, Radburn had made several major contributions to city building progress. Its scheme of development exhibited a wholesome freshness of approach to the design of residential property ever since. And the concept of a new suburban town, deliberately planned and well planned for modern living, carried on despite the failure of that concept to achieve complete physical form. Radburn was the first expression in this country of the English garden city idea that had already led to the establishment under private sponsorship of two successful satellite cities outside of London and that has since inspired the British government's present policy of partial dispersal for its big urban concentrations.

Radburn had been preceded by a number of well planned new towns designed to house the working forces of a major industry or group of industries but rarely intended, as Radburn was, to illustrate a new form of metropolitan structure. One of these cities, Kingsport, Tennessee, is worth special mention because it was designed for a well balanced

group of industries, and because it exemplifies an important phase of urban and industrial decentralization, the introduction of a modern industrial city into an area previously rural and well apart from the nation's major industrial areas. Started in the early twenties by a railroad wishing to create new traffic on its line, Kingsport was from the start a notably successful business venture. Unfortunately, its influence as an example was weakened by its remoteness from the usual arteries of commerce and its consequent failure to attract the attention of business executives who might have found it worthy of emulation.

Both Radburn and Kingsport influenced the thinking of the Tennessee Valley Authority in 1933 when it determined to build its village for construction workers at Norris Dam in a form that would permit its later expansion into a small but well planned satellite suburb of Knoxville. The site of Norris was protected by an encircling belt of rugged open land that prevented inimical fringe development during the period of dam construction and which fortified its unity and character as a permanent town. The recent sale of the townsite to private investors perhaps presages its full development in the form originally contemplated.

More significant in their contribution to the art of city building were the three greenbelt towns that followed Norris. Built by the Resettlement Administration in the middle thirties they were located outside of Washington, Cincinnati and Milwaukee as examples of the satellite method of metropolitan expansion as opposed to the usual fringe development or unplanned urban sprawl. Full development was prevented by the fact that they were started as work relief projects and curtailed when relief needs declined but they did important pioneering in the field of sound suburban development.

While neither they nor Radburn or Norris have yet reached their contemplated size and form and so served as a mature example of planned urban decentralization, all five towns have exerted a marked influence on the thinking of a nation incipiently conscious of the defects of its old city forms and seeking light on new ones. That influence can be seen in the current construction, by American Community Builders, a private corporation, of the new town of Park Forest, 35 miles south of Chicago. It is planned as a complete satellite city with an ultimate population of 30,000 and has progressed to the point where the initial units are being opened for occupancy. It is worth more than passing notice that construction of the first three thousand dwellings in Park Forest is being undertaken by three insurance companies seeking a safe investment for their funds.

INCREASING SCALE OF BUILDING OPERATIONS

As this is written, announcement is made of another satellite town to be built by private enterprise on a 2100 acre site in Fairfax County, Virginia, south of Washington. It is planned primarily as a residential suburb with a contemplated ultimate population of 45,000. Whether it will serve as a demonstration of good satellite city development outside of Washington is not yet clear.

It is indicative at least of the increasing scale at which residential developments are being built, outside of Washington and elsewhere, something that is significant in itself because it illustrates the growing ability and willingness of financial and building organizations to operate at the scale required for the carrying out of a major program of new city building. Perhaps the most significant feature of the Park Forest development at Chicago is that there, for the first time, insurance company financing of new housing projects was extended to projects located in a new city instead of to projects located in or adjacent to an old city.

Of the many new projects in an established city, one is worth special notice because of its size and location. It is the combined Stuyvesant Town and Peter Cooper Village of skyscraper apartments now nearing completion in the heart of Manhattan Island, financed by the Metropolitan Life Insurance Company. The combined projects will house in the neighborhood of thirteen thousand families, equivalent to a city of 45,000-50,000 people. While this project runs counter to the trend of deconcentration—it doubles the population previously resident on the site—it nevertheless is significant on several counts. Patently, the same amount of money and effort that was put into its construction could have purchased a complete new satellite town outside the congested area of New York. The fact that it was not directed into that channel but was spent instead in increasing the congestion of the nation's most congested city has led to a widespread and healthy questioning of the whole philosophy underlying the country's urban growth.

This questioning was recently reflected in the address of Mr. Paul Windels, President of the Regional Planning Association of New York, before the 1948 National Citizens Conference on Planning, and published in the June issue of the Association Bulletin under the title "At the Crossroads." Mr. Windels estimates that there will be 1,100,000 more families in the New York Region by 1970 and that to take care of that increase alone will require the building of homes and other facilities equal to eighty cities the size of Stamford, White Plains or Montclair. He briefly compares the relative merits of providing for that growth by the usual method of urban sprawl and by directing it into suburban satellite communities with their integrity preserved and comes out strongly for the latter method. Since this address was made by the head of the planning agency which has been continuously studying the development of the New York Region since the preparation of its first comprehensive regional plan in 1925, the conclusions are particularly significant.

WHERE DO WE GO FROM HERE?

The record shows that the United States is traditionally a city building nation and that, belatedly and slowly, it is experimenting, through both public and private channels, with the building of new cities calculated to meet modern requirements. There is ample evidence of its capacity to build cities in quantity, scattered but healthy evidence of its interest in improving their quality. When one considers that the current rate of city building is approaching the equivalent of a hundred new cities of 40,000 people a year, it is not too encouraging to find that less than one per cent of that effort is actually going into the building of well planned new towns. But something is better than nothing and a

start is being made. It took the British forty years to progress from the building of the first garden city satellite of London to the declaration that the building of such satellites would henceforth be favored as a matter of national policy. Perhaps we, who pride ourselves on our willingness to accept new ideas, can make the jump more quickly.

To do so will require no new machinery of government or finance or construction. The building industry has demonstrated over and over again that it can undertake large scale city building projects and carry them out efficiently, despite the fact that a large part of the industry still operates on antiquated and inefficient lines. Financial institutions have shown their ability and willingness to finance large scale development despite the fact that much of the financing of city construction is still done on a small scale and often unenlightened basis. And governmental devices have been developed and adopted for aiding and expediting the building of well planned new cities despite the fact that to date they have been applied primarily to the redevelopment or improvement of old cities.

Illustrative of the last point is the recent widespread adoption of measures dealing with urban redevelopment. Along with the recognition that blight was a major obstacle to the healthy economic life of American cities there has come a demand that something be done for its elimination, that blighted areas be redeveloped into healthy areas. Out of this demand has emerged a formula for a partnership of public and private enterprise to bring the redevelopment about. First came the recognition that blight constituted a threat to the social and economic stability of cities and that its elimination was in the public interest, a public purpose justifying use of governmental powers to condemn and assemble land. Second came the recognition that if it was in the public interest for cities to acquire and clear blighted areas within their borders, it was equally in the public interest that they plan and control the redevelopment of those areas on a healthy basis. So the final formula for dealing with the situation became one in which the city is given authority to define areas of blight, to condemn all properties within them, to plan the type of redevelopment which will restore them to healthy usefulness, and then to lease or sell to private enterprise, public housing authorities or other agencies the portions of the area that can best be developed by them in accordance with the plan. State laws and constitutional amendments embodying substantially this formula have been adopted by twenty-four states within the past ten years.

These redevelopment laws represent a substantial, in fact a revolutionary advance in American thinking on urban problems. They give legal sanction to the well known fact that most of our large cities are in bad shape physically, economically and socially, so bad that the powers of the government must be involved to correct it. The interests of the community as a whole are placed clearly above the interests of individual property owners within the blighted areas. This principle has always applied to the routing of streets and utilities and the acquisition of property for public use, but it has never before applied to the remodelling and rebuilding of whole city areas in which both public and private uses of land are involved.

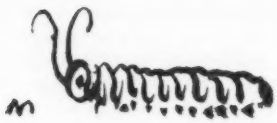
So far this concept has been applied only to the redevelopment in place of city areas that are obsolete and economically sick. But the cure for a sick area may not lie in its redevelopment in place, and such redevelopment may not restore to the affected city the health that it is seeking. If one of the causes of blight is congestion of population, the cure will call for the housing of fewer people on the site and provision for the remainder elsewhere, perhaps entirely outside the existing city area. In short, a large scale attack on the problem of urban blight may call for a solution involving both the redevelopment of the in-town blighted areas and the development of new areas out of town. It is just such a solution that is now being sought in London, calling for a substantial reduction in that city's population and provision of space in satellite cities entirely separate from the central urban area.

Thus it takes only a logical extension of the accepted procedures of urban redevelopment to provide for the building of new communities through a similar companionship of public and private enterprise. For the acquisition of adequate sites, the protection of their surrounding greenbelts against intensive development and the supplying of roads and utilities, the established powers of government can be invoked. For the building and operation of houses, stores, factories and other city elements customarily considered private, the usual mechanisms of private enterprise can be used.

Perhaps other insurance companies beside those now sponsoring projects in the new city of Park Forest would like to sponsor projects in new cities if the basic framework for such operations were available. Perhaps the mercantile and financial groups which are sponsoring new suburban shopping centers would prefer to sponsor the shopping facilities of planned new towns if they had the choice. Perhaps the industrialists who are placing factories around the outskirts of big cities would rather place them in well planned industrial satellites if they could. At the present time the haphazard sprawl of American cities is continuing not because entrepreneurs prefer it but because they have no other choice.

The thing that is lacking, as pointed out before, is not money or construction activity, or legal machinery, or willingness to do things differently. All these exist. The thing that is lacking is an informed public consciousness of the advantages to be gained by channeling the nation's city building activities into patterns that better fit the requirements of modern peace and modern war, plus the formulation of governmental and business policies to implement that consciousness. The achievement of a vastly superior pattern of urban living in this country does not require that the American people do any more than they are doing now, it merely requires that they do it better. It took the blitz to convince the British that the better way was worth the effort. God help us if we wait for that form of persuasion.

NATIONAL SECURITY FACTORS IN INDUSTRIAL LOCATION



The preceeding article by Tracy B. Augur discusses the general question of urban relocation. The specific security factors involved in industrial location are given in greater detail in the following condensed version of a report released on July 22 by The National Security Resources Board, of which Arthur M. Hill is chairman.

This booklet is limited to the problems of industry location and relocation, but even this is a large order. These problems cannot be solved overnight. Neither can they be solved by the Government alone.

Industry, itself, has a big stake in the proper dispersion of its facilities in order to safeguard not only the national security, but also its own existence.

The staff of the National Security Resources Board, which made this study, does not pretend to have all the answers. It merely offers some suggestions so that industry and government, working as a team, may arrive at practical and economically feasible measures for the protection of both industrial facilities and the Nation's security.

PURPOSE OF THE REPORT

This country's policies must be directed, at one and the same time, towards making every effort to build a stable peace and towards being adequately prepared in case those efforts fail. Therefore, attention must be directed to the risk of a possible enemy attack against industry. The purpose of this booklet is to describe the nature of this risk and to indicate some action which industry might feasibly take.

More specificaliy, the purpose of this booklet is:

(a) to alert industrial leaders to the strategic significance of industrial plant location in the event of another war;

(b) to suggest that industrial leaders think of strategic location or relocation of plant facilities as an added essential factor in any plans for plant expansion;

(c) to impress upon industrial leaders the urgency for this type of thinking. Urgency, not because a national emergency is necessarily imminent, but because 12 to 14 billions of dollars are being spent annually for new plants and new equipment. A substantial portion of these plants is being located in highly concentrated industrial areas, thereby increasing vulnerability in the event of attack.

NATURE OF THE RISK

There is no known military defense against the atomic bomb itself except space. There is and will continue to be defense against any carrier which a potential enemy might use to deliver such a bomb. This defense alone is not sufficient.

The constantly increasing range of aircraft makes it reasonable to assume that within the foreseeable future no area in the United States will be immune from possible attack because of its location alone.

The risk of a sneak or unconventional attack becomes great because of the formidable and possibly decisive advantage which could accrue to a powerful enemy in modern warfare by choosing the time, place and mode of attack. Sabotage and other methods of destruction would probably be attempted in an effort to prevent effective industrial mobilization for retaliation. Atomic bombs could be delivered simultaneously by plane against strategic industrial targets and by ship against our vulnerable ports.

Modern strategy presents these problems: Can industry, through location or relocation, achieve a reasonable degree of security if faced with the risks outlined above? Is it feasible? The answer is that dispersion of industry will go a long way toward combating a potential enemy's effort to cripple our industrial capacity by any mode of attack, conventional or otherwise.

Any aggressor nation planning to use atomic weapons will be faced with the problem of the number of atomic weapons that he could make available. Atomic bombs are expensive. The essential fissionable elements—uranium and plutonium—are scarce materials. Any aggressor nation must, therefore, assess a target in terms of the amount of fissionable material it is considered profitable to allocate to its destruction.

There is the additional factor of the expense of bomb delivery. As range increases, relative payload decreases, and costliness in proportion to damage becomes greater. To this must be added whatever loss may be incurred in delivery through active interception.

FACTORS IN RELOCATION

We may reasonably assume that no country in the foreseeable future will ever have enough atomic bombs to afford to use one on each city of as few as 50,000 people, or on a congested industrial area of less than five square miles.

Atomic bombs exploded to date have destroyed almost everything within a one-half mile radius of the zero point. Allowing for future developments, it is not expected that an improved bomb would cause heavy damage beyond a distance of three miles from point of detonation. The possibility of a super bomb that will wipe out an entire state is too remote to warrant serious consideration.

Before evaluating present plant locations or proposed plans for relocation or expansion in terms of relative security or vulnerability in the event of attack, let us review those implications of modern strategy which make plant location of strategic importance:

(1) Any attack upon the United States will be designed to cripple vital industry;

(2) Any such attack may be expected to be made suddenly and to be of such magnitude that general de-

struction in the areas affected can be assumed;

(3) The only lead time we can depend on is that required by a potential enemy to produce and be able to deliver atomic bombs, plus whatever time may be obtained by diplomacy;

(4) The present geographical location of any facility in the United States cannot be considered safe simply because of its remoteness from a potential enemy;

(5) A high concentration of industry or population in a given area constitutes the best target for atomic or other modern weapons;

(6) Attack upon areas of industry concentration less than five square miles or urban concentrations of less than 50,000 people will probably not be economically feasible unless they contain specified installations of decisive importance to the nation's capacity for defense;

(7) A location less than three miles from a potential target center of an atomic bomb is seriously vulnerable.

EVALUATION OF PRESENT LOCATION AND ALTERNATIVES

The strategic planner of a potential enemy, in appraising the area in which your facilities are located, will be looking for certain objectives. Here is a list of the kinds of facilities in which he most likely would be interested:

(a) An individual plant, producing a large percentage of a highly critical item, which if destroyed, would have immediate far-reaching adverse effects on the production of that and other related items.

(b) All major developments, industrial or otherwise, which could be considered highly inflammable or explosive. This would include such things as oil refineries, oil storage facilities, paint and chemical plants.

(c) Public utilities such as power plants and water systems which service a general industrial area.

(d) Railway, water, and other transportation facilities.

(e) Key establishments of the Armed Forces.

(f) Dams and related works and bridges.

(g) Major air bases and air supply centers.

(h) Several plants all engaged in the production of related items of military importance or materials, such as trucks and steel.

It is suggested that the problem of assessing the vulnerability of your facilities be approached in the following manner:

Draw a three-mile radius circle about the periphery of your present facilities. List everything within this circle which you believe would be of interest to the potential enemy.

In considering your production, think in terms of both peace time and war time conditions, to determine whether your facilities might be or become a major military objective. A large aircraft plant, a shipyard, a large aluminum plant, each obviously could well become very important to an enemy. Generally, prime contractors for the production of war materials, in varying degrees of importance, also could consider themselves in this class. Certain basic material plants and many component plants also would be included.

The size of your facilities and others within the area concerned should not be the sole influence in your decision. A small instrument plant, for instance, might be highly critical. Likewise, the fact that your industry is a heavy or a light industry has little bearing. The real determining factors are the actual use our military forces will make of the items produced and the amounts of such items as compared with the actual requirements, and the possibilities for employing substitutes. Even if you believe your facilities alone would not be classed as a primary objective, the existence of any other facilities within this three-mile radius, which could be so classified, is as much a matter of your concern as if your own facilities were directly involved.

Further inquiry into your facilities may show that only a single unit, if destroyed, would result in a 100 per cent stoppage of production for several months. All such units should be identified. While, of course, no attempt is likely to be made to knock out a single plant with an atomic bomb, conventional bombing techniques have improved to a point where such destruction is easily possible.

As a result of your investigation, you should be able to conclude the following:

(a) Whether your facilities should be relocated;

(b) Whether part of such facilities should be relocated;

(c) Whether no further expansion should be attempted in the present area.

If removal of part or all of your facilities is indicated, it is not recommended this be attempted at once. This probably would not be economically practical. It is suggested, however, that any expansion of facilities in a location with a substantial degree of vulnerability be avoided.

It is also suggested that efforts be directed to the development of a progressive dispersion plan built around normal expansion and obsolescence factors. The important thing is to devote study and efforts with a view to making the earliest possible start toward dispersion as the means of achieving a reasonable degree of plant security.

Studies made to date indicate that areas of industry concentration less than five square miles, or urban concentrations of less than 50,000 people, separated by about 10 miles of relatively open country, will be reasonably secure from attack under all circumstances expected to prevail. These factors may be employed as a yardstick in evaluating prospective sites.

Your thinking should be projected in terms of the probable growth or foreseeable developments in the prospective area which may make it strategically vulnerable.

Topographical features of terrain become significant. Hiroshima and Nagasaki were chosen as targets for the atomic bomb because of their strategic concentration of industrial activities. Deaths in Nagasaki, however, despite its greater population density were only one-half those at Hiroshima. Topography was the major factor in accounting for this difference. The Nagasaki bomb dissipated much of its energy against hills and unoccupied areas.

Industry fared better in Hiroshima. All major factories were reasonably well dispersed and escaped serious damage. At Nagasaki, plants and dockyards at the southern end of the city were left intact, but those concentrated in the valley where the bomb exploded were almost completely destroyed.

Of course, a fundamental requirement in any survey of an area for selection of a location is that it be economically feasible to the particular

(Continued on Page 320)

UNITED NATIONS ATOMIC ENERGY NEWS

Peter Kihss

Mr. Kihss, the representative of the NEW YORK HERALD TRIBUNE at Lake Success, reports negotiations on atomic energy control for the BULLETIN. Next month Stephen White, who has been assigned to the Paris office of the TRIBUNE will report on developments at the UN Assembly.

Secretary-General Trygve Lie has called attention to the danger and probable growth of bacteriological and lethal chemical weapons, and proposed that the General Assembly of the United Nations take up this problem as well when it debates the atomic control deadlock in its Paris session opening September 21.

A series of recriminations marked completion of the second progress report of the Commission for Conventional Armaments to the Security Council, dealing with non-atomic disarmament efforts.

Receiving a report from the working committee August 2, the Commission heard Frederick H. Osborn declare the United States believes work should continue "with as little delay as possible," to develop a system of arms regulation to be carried out when conditions of international confidence permit.

"The work of this commission has continued to be hampered by 'demigogic appeals and irresponsible propaganda,'" Mr. Osborn said. "We cannot but note regretfully that the Soviet system of obstructionism in this commission is the same as that employed by them in the Atomic Energy Commission. Nevertheless, the United States believes that the commission must proceed with its work."

Ukranian Foreign Minister Dmitri Z. Manuilsky retorted that responsibility for lack of progress in disarmament rested on "those who wrecked the work of the Atomic Energy Commission." He said it was impossible to separate the regulation and reduction of armaments and armed forces from the prohibition of atomic weapons and control of atomic energy. Soviet Deputy Foreign Minister Yakov A. Malik chimed in that it was the United States and United Kingdom which had declared disarmament couldn't begin until previous conditions were fulfilled, seeking to cover up a lack of desire to disarm.

On August 9, Mr. Malik told the disarmament group that the United States had wrecked the work of the Atomic Energy Commission, and thereafter had argued that one of the essential conditions for international confidence didn't exist—so disarmament couldn't be carried out. Once again he proposed the old Soviet formula for general disarmament principles, including limitation and prohibition of certain armaments, a ban on atomic weapons, and a system of control within Security Council framework.

Sir Alexander Cadogan, of Great Britain, protested this Soviet plan was based on proposals rejected by the commission June 18, 1947 and by the Security Council July 8, only to be re-introduced again October 13, 1947. While the Soviet proposal spoke of a control system within Security Council framework, Sir Alexander commented:

"Those of us who have followed the history of the Security Council and the debates on a similar problem in the Atomic Energy Commission will know how much effort to derive from that. But there is not a vestige of recognition, in the Soviet paper, of the fact that no person on earth can have any confidence in a paper system of disarmament, whatever the excellence of its provisions, unless and until there is some evidence in the world about him of international good faith and the readiness of those primarily concerned to sink differences and to cooperate for the achievement of purposes which they have solemnly undertaken."

Among this needed evidence, Sir Alexander said, the control of atomic energy was "a task whose priority was acknowledged by the Assembly of the United Nations at its very first session in London."

Mr. Manuilsky said the Soviet Union proposed, among other things, time limits, with inspection as a control. What objection could the United States and Britain make if they really wished disarmament, he demanded. It couldn't be an objection to inspection, he said, for the Soviet Union supported inspection "provided, however, there was something to inspect."

In atomic production controls, Mr. Manuilsky said, the Soviet Union contended inspection should cover not only nuclear fuel but the prohibition of the use of such fuel for military purposes. "Official circles of the United States," he said, "had no intention" of obeying a ban on atomic weapons, and "thereby also doomed to failure the work of the Commission for Conventional Armaments."

"The most responsible government and m i l i t a r y officials," Mr. Manuilsky went on, "were openly declaring that the United States could not even envisage any limitation of her armaments, that the atomic weapons must be kept in the armament of the United States forces, and that the United States must possess such military strength as would enable her at any moment to start military operations."

He contended the Soviet Union was demobilizing army classes, and concentrating on peaceful economic reconstruction. No state threatened the United States, he argued, but "those in the United States who are interested in an armaments race have artificially created a war psychosis tending to produce uncertainty and anxiety throughout the world."

Mr. Manuilsky saw a vicious circle —"if it is argued that the disruption of the work of the Atomic Energy Commission, which has impaired international confidence, predetermines

the failure of the Commission for Conventional Armaments, will not this failure be used as an excuse to bury once and for all the question of the prohibition of atomic weapons and the employment of atomic energy exclusively for peaceful purposes?"

The United States says it favors continuation of the disarmament commission's work, Mr. Manuilsky noted, but he demanded: "What are we to do with the fact that the Atomic Energy Commission has ceased to function, since its success would truly have been one of the fundamental safeguards for international confidence?"

On August 12, the commission finally approved two resolutions previously adopted in the working committee. By eight votes to two, with the Soviet Union and Ukraine dissenting and Syria absent, it approved the definition of "conventional armaments" to exclude atomic weapons and other weapons of mass destruction, as voted in committee September 9, 1947. Mr. Malik again contended this was an artificial separation and a violation of the Assembly's December 14, 1946 disarmament resolution, which he held hadn't differentiated or counter-opposed these two questions.

By nine votes to two, the commission then approved the statement of principles voted in committee July 26, which listed conditions to be fulfilled before disarmament could be effected.

On the entire progress report, Guy de la Tournelle, of France, said disarmament preparatory studies must be carried out, and held preliminary measures would themselves develop international confidence. "The study of the reduction of conventional armaments," he said, "can and should be conducted independently of study of the prohibition of atomic weapons. This principle was made clear in the discussions of the General Assembly of 1948. . . . Atomic energy is capable of practical application and offers a new field in which everything remains to be done, whereas conventional armaments constitute a purely military domain, long since incorporated into the life of nations." He recalled that, while atomic weapons were to be absolutely prohibited, conventional armaments were only to be regulated and reduced.

On August 17, the commission finally completed study of its report, taking no vote on the whole but agreeing the report would be deemed approved if no delegation requested a final reading before September 15. It will be up to a commission chairman to convene the next meeting, with the chairmanship rotating alphabetically each month —Syria in September, Ukraine in October, U.S.S.R. in November, United Kingdom in Decber, and United States in January.

During the month, Mr. Osborn revealed the United States had appointed a psychologist, Dr. John W. Gardner, executive associate of the Carnegie Corporation, on its atomic delegation back on May 22, 1947, and still retains him as consultant when needed, without compensation. Dr. Gardner's task had been to study any possible new approach to agreement with the Russians. After about a month's attendance at commission and committee meetings, he put the issue up as a full-scale study problem to colleagues in psychology, anthropology and related fields. Out of all this grew the Russian Research Center at Harvard University, launched with a $100,000 Carnegie Corporation grant last December, and recently given $640,000 more for a long-range study of all phases of the Russian problem.

In Geneva, the Economic and Social Council on August 27 heard Aleksis P. Pavlov, of the Soviet Union, complain about stories in the United States press describing an atomic war against the Soviet Union, but he said the U.S.S.R. was not afraid and believed that "time works for us." Mr. Pavlov said the Soviet Union favored peaceful competition between capitalism and socialism."

A long-hidden chapter of the United Nations Atomic Energy Commission came to light during September, and disclosed that the United States, at the very first meeting of the scientific and technical committee had urged interchange of both atomic and all other scientific information for peaceful purposes—only to be rebuffed by the Soviet Union.

It was the late Dr. Richard C. Tolman, chief scientific aid to Bernard M. Baruch, who, according to new records taken off the restricted list, proposed at a closed meeting July 19, 1946 that the U. N. scientists:

" . . . discuss the interchange of scientific information for peaceful ends, in general as well as in the field of atomic energy. This would include the consideration of exchange of scientific publications, cooperation between Academies of Science and other scientific bodies, the interchange of students, professors and research workers, and the resumption of international progresses in the various fields of science. A notable step in this latter direction was taken in the recent celebration of the anniversary of founding the Russian Academy of the Russian Academy of Science."

To this, the Soviet Union's Andrei A. Gromyko "observed that world congresses and conferences mentioned by Dr. Tolman (United States) may be important, but it would require several months to call such a conference. The committee should therefore consider its program of information exchange from the point of view of the realization of the immediate tasks of the Atomic Energy Commission."

During the month, the preliminary edition of the scientific volume of the U. N.'s atomic bibliography was released, containing 3,982 items on radiation and isotopes in biology and medicine, culled from publications in a score of nations since 1920. A general introduction by Dr. J. Robert Oppenheimer, director of the Institute for Advanced Study, Princeton, said:

"In two great fields, at least, cooperation, openness and the free publication of results have largely returned, and are again the practice in many parts of the world.

One field is the effort at extending and deepening our knowledge of the atomic nucleus, of the particles of which it is constituted, and of the laws and regularities which describe the properties of these particles and their interactions.

"The other great field is the application of tracers, largely by-products of the operation of the fission chain reactor, as instruments in most of the sciences, including medicine, and many branches of agricultural and industrial technology.

"Work bearing directly on the technology of the large-scale release of nuclear energy is still being conducted predominantly in secret, on a national, or at most, multi-national basis.

"Published accounts of such work would appear to be mostly of a rather general and descriptive character, suited perhaps to a rough understanding of the developments, but not providing an adequate basis for traditional international technical collaboration.

"Protestation of hope that in this field, too, there would be complete openness have been expressed by the representatives and scientists of many nations. Until now, however, there has been, as is well known, an essentian divergence of views as to the safeguards that would have to accompany such complete disclosure."

Dr. Oppenheimer said that "in the vast areas in which free publication is possible, its scope, interest and quality are most impressive," and the bibliography indicated "a salutary present situation."

Drs. Harold C. Urey and Raymond E. Zirkle, of the University of Chicago, contributed introductions to sections of the bibliography, and an appeal for further data by Jan. 15, 1949 was made public, to enable a printed edition early in 1949. Work on the scientific volume began in mid-July under Dr. H. H. Goldsmith, of Brookhaven National Laboratories, aided by Stuart R. Schram, consultant.

EIGHT SCIENTISTS PROTEST THOMAS COMMITTEE'S METHODS

(Continued from page 290)

We wish to stress that in our opinion the Atomic Energy Commission is in no way to blame for the unfortunate situation that now exists. Since its formation, the Commission has worked vigorously to establish adequate centers for our atomic research. But the Atomic Energy Commission has been needlessly hampered because atomic energy has unfortunately become a "political football". As a result the Commission has had to adjust its own workings to the atmosphere created by the Un-American Activities Committee.

No nation without adequate scientific resources can hope for any degree of security in the event of another war. In the face of this fact, it is important that the leaders of our nation attempt to understand the conditions under which scientific research can be and cannot be done. In particular, if our nation is to have a vigorous government research program, the unhealthy atmosphere that has been created by the Un-American Activities Committee must be removed. We urge that you investigate this situation, and then direct your powers in an attempt to secure a remedy.

NATIONAL SECURITY FACTORS IN INDUSTRIAL LOCATION

(Continued from page 317)

industry concerned. With few exceptions, however, economic advantage and relative strategic safety will not be incompatible.

Adequate dispersion is considered the most practical solution to the problem of strategic location.

Underground installations, although probably providing maximum protection, are not thought practical for application on a large scale. They generally entail higher construction costs. This is also true of special construction of above ground facilities, employing fire, blast, or radiation resistant materials. Resort to this type of security will probably be economically justifiable only in connection with such highly strategic facilities as may be determined by the Armed Forces.

In planning for dispersion an attempt should be made to disperse not only a maximum number of your manufacturing installations, but also the manufacture of individual products.

Decentralization of population and industry is actually taking place. A host of pressures is at work in this direction.

The National Industrial Conference Board in its study, "Decentralization of Industry", makes the following statement in this connection:

"There is a trend toward locating manufacturing plants in the smaller cities and towns. Cities and towns with 10,000 to 100,000 population are reported to be the most popular places for plants established from 1940-1947. Only one-third of the plants built or acquired since 1940 are in cities of 100,000 and over. For plants established prior to 1940, close to half were in cities of that size. On the other hand, almost 30 per cent of the plants established since 1940 are in towns of 10,000 or less, against only 20 per cent of the plants built before 1940."

Many industries are very dependent upon skilled labor, which is normally thought to be relatively immobile. Further developments in decentralization of population plus the growing development in simplified manufacturing techniques, semi-automatic machine tools, etc., go far toward reducing dependence upon localized supply of highly skilled labor. To these factors should be added the incentive to movement that can be created for workers in the form of better working and living conditions.

It may also be anticipated that agencies lending money for long range capital expenditures will give thought to location as a risk factor. Thus, decentralization may be given further impetus.

It remains industry's problem to take maximum advantage of this pattern to insure that new plants are located with a view to maximum security.

The job of dispersion is one that industry must assume, for both its own protection and that of the national security. Ours being a democratic nation dedicated to the principles of free enterprise, the government can neither dictate nor finance such a large-scale change in the industrial pattern.

Note: The suggestions made in this pamphlet are not intended to encourage the relocation of manufacturing facilities for the purpose of adversely affecting wages, working conditions, and union contracts.

POLISH VERSION OF EINSTEIN'S MESSAGE

This is a translation of the message attributed to Dr. Einstein in Poland. It is completely dissimilar to the actual message sent by Dr. Einstein to the World Congress of Intellectuals, which met in Breslau during August. The correct text appears on page 295.

"I appreciate very much the honor you made me by notifying me of the plan of convoking in the near future a Congress of Intellectuals. I learned with great interest that the congress has as its aim to discuss and support the cause of real and essential peace.

"Nowadays, when the political situation is extremely tense, the solution of our problems becomes particularly important from the historical and philosophical point of view. We must have the courage to discuss the most up-to-date problems without losing our way in the petty political differences of everyday life. History has taught us that brutal struggle has never led to a stablization of conditions and will never create a proper basis for the solution of our most vital problems. This comes true especially now when another war would mean devastation on a hitherto unknown scale.

"Wishing to avoid this dreadful danger, we must overcome national egotism and cease thinking in categories of brutal physical strength. I most devoutly hope that you will succeed in gathering within the framework of such an important congress men of wide scope and true courage. I also hope that they will support everywhere your endeavors for men to reach mutual conference onlywhen they fight for unbiased understanding and recognition of their right to progress."